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Minister for Agriculture.

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INTRODUCTION.

The publication of a monthly journal in the interests of those engaged in agricultural pursuits is justified by the regular accumulation of reports on the labours of the officers of this Department. We have also to observe the popularity of the gazettes issued by other States and foreign Governments.

Victoria can, of course, learn much from these countries, where the natural conditions, commercial advancement, and facilities for trade are similar to her own, but she has to depend on her own initiative in drawing riches from the land.

Our geographical position, soil, and climatic variations impose considerable research work and experiment in the interest of the farmer, dairyman, stock-breeder, vigneron, and fruit-grower.

The wasting influence of our hot dry summers calls for the most skilful methods of manuring, cultivation, selection, and cropping, and it is the obvious duty of a State Department of Agriculture to make exhaustive trials of all available material, and provide as far as possible safe guides for the labours of others.

It might appear that an annual report of the work of the field officers would supply the same material in a more condensed and less expensive form. But the annual must ever be largely a review, which in daily practice is not wanted so much as the forecast, and this the Journal will aim to furnish. It will, moreover, enable every producer to learn the nature and value of each officer's teaching and practice from month to month, and in so far as the Department has permanent institutions, experiment stations, and demonstration grounds, and its own officers actually responsible for their management and success, the deductions and advice tendered in a seasonable and workable form must prove of great value. The functions and responsibilities of the various officers have now been more clearly defined than heretofore. This must have a decidedly beneficial effect, and will enable each to become more directly helpful to those concerned with his

particular labours. Each officer has been instructed to confine himself strictly to studies and engagements which will prove of most direct and permanent value to our rural industries, and the articles, illustrations, and instructions will, it is hoped, be so arranged that producers with ordinary intelligence and capacity will be enabled to derive benefit from them.

As a means of extending our Inter-State and foreign markets the Journal should prove of much value, for it will contain items of interest to the speculator and business man, and will be freely circulated in the commercial centres of the world.

JOHN MORRISSEY,
Minister of Agriculture.

Department of Agriculture, Melbourne,
1st January, 1902.

THE CHEMICAL BRANCH.

THE VALUE TO THE FARMER OF THE LECTURE AND DEMONSTRATION FIELD.

By F. J. Howell, Ph.D.

The first part of the series of lectures I intend to deliver during the spring and summer months of 1901–2 closed on the 16th of last month at Nhill. It was no small pleasure to me, comparing the splendid meeting at this town on the occasion of my last visit with my experience of two years ago. On my first visit, a half-dozen farmers only thought it worth while to leave their homes to attend the announced lecture. On the 16th of last month, the attendance must have exceeded 250. The later experience at Nhill was the experience at every centre I have lectured at.

The Practical Outcome of the First Lectures.

The method of presenting facts, the mode of delivery, lucidity of expression, and other matters, are points of importance in a lecture delivered to a body of farmers, and therefore deservedly demand consideration; but I have attempted to look beyond this, and my object has been to make converts, rather than to please and captivate my hearers by points of eloquence. I have, therefore, put forth every effort to induce each man in the audience to carry into practice the ideas I expounded, rather than to impress with the mere idea that he had just heard a good speech. In short, I have attempted to invest each lecture with something that would appear in an after-result of practical value. I modestly venture to claim that I have succeeded in such efforts in a measure exceeding even my expectations. The experimental plots that I had advocated under Mr. Pearson's directions, and that were put down in every centre at which I delivered lectures, have, in conjunction with those lectures, aroused an amount of interest that appears surprising. They have produced such an influence on the farm practice of certain districts as to almost amount to an entire revolution in the methods employed, and I in no way exaggerate when I say that the old prejudice against scientific teaching has largely given way to an enthusiasm equally as marked. In the review of my lecture on "Tillage" in the *Dunmunkle Standard* of Murtoa, it is stated—"The lecturer received the welcome given to an old friend, and was loudly applauded." The same feeling was shown in every district I visited; for the facts of the field had everywhere confirmed the earlier statements of the lecture hall.

But the statements which have appeared in the press indicative of the altered attitude of the farmer towards scientific teaching are the echo only of what has been told me right through the country. For instance, Mr. Josephs, president of the Kaniva Agricultural Society, informed me that on the occasion of my first visit there were only two drills in the district, and that now he thought every second farmer had one. At Jeparit, Dimboola, Minyip, Warracknabeal, Bealiba, St. Arnaud, Donald, Birchip, Boort, and Wycheproof, there was much the same story, viz., the yearly income of manures at each town jumping from a few tons to, in some cases, hundreds of tons, and the drill becoming the rule and not the exception. Present indications lead one to believe that in a very short time, indeed, it will be difficult to find a farmer in our wheat-growing area who has not adopted the use of the drill and manure as the regular practice in his farming operations.

The battle of manuring has, then, been fought and won, and the prejudice of the farmer in this respect overcome.

The lecture and demonstration field have been the most effective means for securing the success achieved in this direction, and I call attention to the fact because it is too frequently assumed that the value of lectures as an educational force among farmers is a very slight one. There is undoubtedly a very small value to be attached to lectures of a purely theoretical kind, explanatory merely of principles, and dissociated from the practical illustration or result of a demonstration field. The mere preaching of principles is not enough: it is the preaching of the principles in conjunction with the results of the demonstration field at the door of the farm that carries conviction. It has done so in the question of manuring, and I have every confidence that it will do so in the other directions I have so frequently pointed out.

Improved Methods of Tillage.

The recent lectures on this subject have been received much more kindly by the farmer than I had anticipated.

In addition to press statements, a number of reports have reached me from agricultural societies, all echoing similar desire for further information on the new soil science.

The Secretary of the Kaniva Society, after complaining of the short notice given for the lecture, writes :—"My Society fully appreciates the grand work that the Department has taken up, which has benefited our district already, and my Society would be pleased if your Department could let us again have the services of Dr. Howell at some future date not far distant."

The Secretary of the Jeparit Society writes as follows :—"Some of our members have asked me to write and inquire whether it would be possible for you to give us another afternoon. The attendance this week was not by any means in keeping with the merits of the lecture ; a fact due to the methods adopted in notifying us only a

few days prior to the event. You will be interested to know that in conversation with farmers since your meeting they are all agreed as *to the merits of tillage.*"

Such statements, I think, contain sufficient evidence to show that lectures are appreciated by a body of men capable of judging, and they are appreciated, not because they amuse or interest for an hour or two, but because of the valuable practical results that have followed the adoption of the teachings they embody.

With a little more care in the mechanical cultivation of the soil, I feel confident that results will follow, just as striking as those produced by the use of manures. It is a significant fact that the average wheat yield on 340 of our unmanured plots, put down last year, in almost every part of the wheat growing area of Victoria should have reached the splendid figure of 12·42 bushels to the acre. The general average for the colony for that year, manured and unmanured, was 8·84 bushels only. That is through the improved tillage the plots received. We succeeded in raising the wheat yield by nearly 50 per cent. above the general average for the colony.

Tilth and the system of the bare fallow with its frequent summer cultivation are coming to be generally recognised as of great importance in any system of successful farming in our arid areas. There is still the necessity of a far deeper stirring in the preparation of the ground, *as also the cultivation of the growing crop to be hammered* home both by argument and field demonstration. That our almost general practice of skim ploughing and shallow cultivation will die *hard I am fully convinced; but that it must die if we wish to more* effectively fight the effects of dry seasons and retain our rainfall I am none the less certain. The truth of this, however, will only be brought *home by the demonstration or field experiment, just as in the case of* manuring. It seems strange that in face of so many accidental illustrations of the benefit of following a deeper cultivation that the farmer *clings with such tenacity to his belief in mere surface scratching.* The statements made by farmers in private conversation after a lecture, are frequently full of suggestion. Take the following :—Mr. Belcher, of Lah, although not ploughing deep generally, had noticed that where deep ploughing had taken place, the crops retained a green fresh appearance three weeks longer than on the shallow ploughed ground. Mr. Hoff, of Homecroft, near Warracknabeal, had noticed that where he had frequently gone up with a plough (for a purpose) in the same track, and had consequently stirred the ground to a good depth, the wheat grown on this portion stood fully a foot higher than the surrounding crop. Mr. Gaudie, of Birchip, a most intelligent farmer, had stirred some few acres to a depth of a foot with a scarifier. The soil was a limestone, and was treated in this way for a potato crop. On the following year the oat crop excited marked attention, and stood considerably above the surrounding crop. Mr. Tunstall, President of the Agriculturel Society, Boort, had noticed much the same thing on land that had been deeply cultivated for maize, the wheat crop of the

following year reaching eight bags to the acre. These few discoveries, made accidentally, are an indication of what vast benefits might on suitable soils and under suitable conditions follow the substitution of a deeper stirring of the soil for the shallow surface scratching at present almost general.

Experimental Farms or Stations.

The recognition of the great value of field experiment for the widening of our knowledge concerning the science of agriculture and its practice, which found expression in the movement initiated by the St. Arnaud Society for the establishment of experimental farms, is the outcome of the smaller experiments conducted so widely for the last twelve years on the farms throughout Victoria, as also of the more recent lectures. The power of science to assist agriculture has spoken so plainly in the growing experimental crops of the many farms throughout the State that an agitation for further developments in experimental work—too complicated and continuous for the individual farmer to undertake—is now growing on all sides. As a result we have the Minister's promise of the establishment of a number of permanent experiment stations. It is the most progressive step that has yet been taken. Conducted on proper lines we should then have the basis for gathering a number of facts which must in the future largely influence agricultural procedure. But there appears to be a great fear in the country that this later development in experimental work is going to interfere with the demonstration plots as at present carried out on the farms throughout the country. Such a belief is, of course, not justified; for, should such a thing take place, it would both lead to present disappointment and render difficult the securing of the co-operation of the farmer when again required, as it must be later on. The purpose of the present fields must be clearly understood. They are really demonstration as much or more than experimental fields. They are necessary, both for answering the hundred and one little questions arising from local differences of soil and climate, as well as for the dissemination of facts, not as spoken words, but as truths visible in the growing crop of the farm. Instead of diminishing in numbers in countries where the experiment stations are already numerous, they are continually increasing; for, as the discoveries of an experiment station multiply, so the necessity for the expression of such facts in the demonstration field on the farms throughout the country becomes all the more obvious. The work already accomplished by them has in certain parts of our State almost revolutionized farming, and no agricultural teacher could regard their discontinuance with anything but the strongest regret. In France, with her numerous permanent stations, there are put down annually from 3,000 to 4,000 such fields; in Canada they are widely distributed; in America the tendency is to an increase, and not to a decrease; and it is not the intention, after succeeding against great prejudice in making the movement popular, to discontinue the practice.

REPORT ON THE FARM COMPETITION AT NHILL.

Department of Agriculture,
Agricultural Chemical Branch, Agricultural Laboratory,
17th December, 1901.

C. Towns, Esq., The Secretary, Agricultural Society, Nhill.

SIR,

I have the honour to furnish the following report dealing with the award of prizes in the farm competitions in your district, for which my services were secured as judge.

The prizes to be given were:—

I. For the best and cleanest crop of growing wheat of 50 acres.
II. For the best and most profitable classes of stock and up-to-date implements.
III. For the best condition and system of fencing.
IV. For the best provision of water supply.

There were two prizes to be given in each case, a first and second.

THE BEST AND CLEANEST WHEAT CROP.

Among all the entries in this class there was not a single crop which, from the point of yield, could not be classed as a good one, but when considerations of cleanness came under review, it was found that there were the same causes for complaint as were prominently present last year, and in only a few cases could the crops competing expect to secure points in this direction. The causes for this, dependent upon peculiarities of season, were, I know, in a large measure unavoidable, but next year ought to see an improvement in this direction. After a careful consideration of all points, I have determined in this class to award the prizes as follows:—

First prize, Mr. Fritz.
Second prize, divided between Mr. Oldfield and Mr. Cramer.

THE CROPS OF THE OTHER COMPETITORS.

All these were good, and in a few cases excellent, but the tantalizing ubiguity of the wild oat was a most unpleasant feature. Mr. Syme's competing crop was a beautifully headed wheat of Sullivan's Early Prolific, a variety that has come a good deal into favour of late. The general crops of this most careful farmer were, I think, the finest that came under my notice, and the paddock of Sullivan's Early and Queen's Jubilee (not competing) near the homestead, was for this season a surprise to myself and the visitors who accompanied me. The competing field of Mr. Deutscher was a clean and nne-headed crop, but falling below my estimated yields of those of the successful competitors. Mr. Deutscher has adopted the drill, and I was pleased to learn from him that his crops this year are the best he has had for the last eleven years. The yields of Mr. Batson and Mr. Bond ought to run into splendid figures, but they are the least clean of those competing.

Best and most Profitable Classes of Stock and Up-to-date Farm Implements.

In this class I found little or no difficulty in making my first award, and I have allotted the prizes as follows:—

First, Mr. Dahlenberg.

Second, Mr. Bond.

The farms of both these gentlemen are well equipped in up-to-date implements, and the stock are high-class and profitable. The horses of Mr. Dahlenberg are exceptionally fine, and it would, I think, be difficult to find anything much better on any general farm throughout Victoria. The cows on Mr. Bond's farm are a really well-bred lot, and a type I should like to see introduced more generally. This gentleman appears to have also paid special attention to the Shropshire cross of sheep, and can claim generally to have a good and profitable class of stock in all branches. Although unsuccessful as a prize winner in this class, I should like to specially mention the draught horses of Mr. Stockings. These are a splendid lot, and compare favorably with those of the winner of the first prize.

Best Condition and System of Fencing.

In this class I have allotted—

First prize to Mr. Dahlenberg.

Second prize to Mr. Voigt.

The fences in the first case are all sheep-proof. The holding of 2,000 acres is subdivided into seventeen paddocks, well fenced, and with particularly good substantial gates on the main tracks.

The holding of Mr. Voigt is only 381 acres, but is divided into seven paddocks, nearly all newly fenced in a substantial way. Each paddock has its easy conveniences for access to the water supply. There are, I believe, five miles of fencing on this neat and well-kept little property.

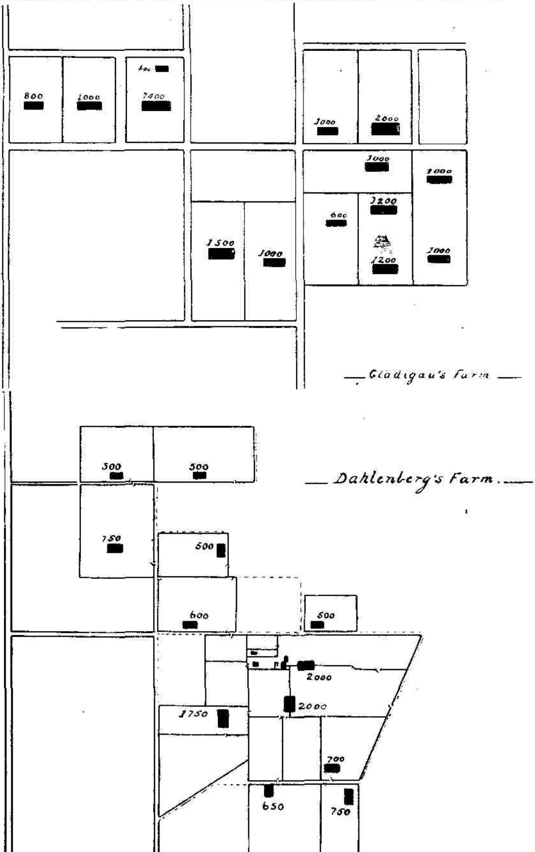
Best Provision for Water Supply.

In our dry and uncertain climate there is nothing deserving so large a consideration in the equipment of the farm as the provision for a good and permanent water supply, and it is a pleasure to notice how fully the farmer is beginning to realize this. I consider it wise that your society offered prizes in this direction, but the splendid provision made on the larger holdings has put out of competition a number of the smaller ones where the arrangements and systems of supply can also be classed as relatively excellent. I have decided in this case to award—

First prize to Mr. Gladigan.

Second prize to Mr. Dahlenberg.

Copies of the enclosed plans which were furnished by the two competitors will show how extensive and complete is the provision for the water supply on the two properties.


800
1000
1400
1000
2000
1000
1000
1200
600
1500
1000
1200
1000
Gladigau's Farm
500
500
Dahlenberg's Farm.
750
500
600
500
2000
2000
1750
700
650
750

On Mr. Gladigau's holding there are fourteen dams with a capacity of 15,100 cubic yards. On Mr. Dahlenberg's farm there are the same number of catchments with a capacity of 13,950 cubic yards, or 1,150 yards less than Mr. Gladigau's. The dams are made up as follows:—

Gladigau.			Dahlenberg.		
1	dam	2,000 yards.	3	dams	2,000 yards.
1	,,	1,500 ,,	1	,,	1,750 ,,
1	,,	1,400 ,,	3	,,	750 ,,
2	,,	1,200 ,,	1	,,	700 ,,
6	,,	1,000 ,,	1	,,	650 ,,
1	,,	800 ,,	1	,,	600 ,,
1	,,	600 ,,	4	,,	500 ,,
1	,,	400 ,,			

On examining these figures it will be seen that nearly one-half of Mr. Dahlenberg's supply is contained in dams below 1,008 yards capacity, while in the case of Mr. Gladigau, not quite one-eighth of the total supply is contained in these smaller catchments, that is, that Mr. Dahlenberg has ten dams below 1,000 yards, and Mr. Gladigau only three. It will be readily recognised that the larger kind of dam carries important advantages which I need not touch on here.

As regards the distribution of the dams throughout the properties and the mode of construction there is little to be said in favour of one competitor over the other, although, for compactness, the holding of Mr. Dahlenberg is to be preferred. The dams of this gentleman gave me the appearance of carrying a slightly better supply than Mr. Gladigau's, but I could find no advantage in his catchment areas to explain this—perhaps the contrary—and I should attribute the fact, if if it really exists, to local thunderstorms, or because the light showery nature of the present year's rainfall had hardly sufficed to fill the larger dams. If there had been a third prize in this class, I should not have hesitated to have awarded it to Mr. Pilgrim. For a small holding the provision for the water supply is really excellent on this farm.

Concluding Remarks.

The work of the second competition, as of the first, has been a pleasure to me. I take no exaggerated view of the value of this competition merely as a competition, but it has been of great value to me, and perhaps of some little to others to have had this opportunity of mixing with and moving among your farmers on their own homesteads. It is what I should like the opportunity of doing throughout every district in Victoria. I have fancied, in moving about your district, that certain little improvements in farming operations are almost everywhere apparent. There seems to be a greater spirit of cheerfulness among your farmers than when I first visited you, and the idea now seems general, that with manuring and good cultivation, wheat-growing may become again a profitable industry. There are still

other matters dealt with in my last lecture which deserve the consideration of your farmers, and if variety seed selection, change of crops, and the question of fodder plants and grasses, only receive the attention they deserve, I feel confident that farming in your district will be lifted to a better and more profitable level.

I am, Sir,

Yours faithfully,

FRED. JNO. HOWELL.

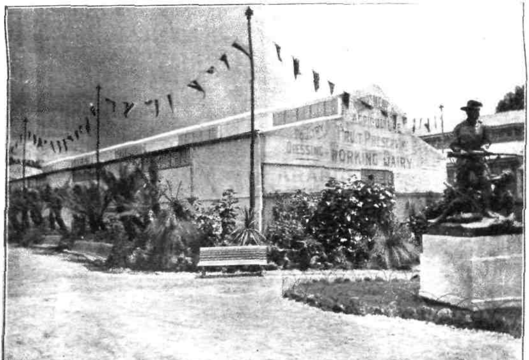
THE GOVERNMENT DAIRY, BENDIGO GOLD JUBILEE EXHIBITION.

By R. Crowe.

"To stand still means to go backwards." Perhaps in no industry does this hold good to such an extent as that of dairying. Only a dozen years ago and practically the whole of the butter manufactured in Victoria was made from milk set in dishes, and churned in vertical dash churns worked by hand.

A glance at the map of Victoria at the back of the dairy in the Exhibition shows the location of every butter and cheese factory and creamery at the present time in the State. In another form the same information is displayed in the shape of a copy of each registered trade-mark used for export purposes.

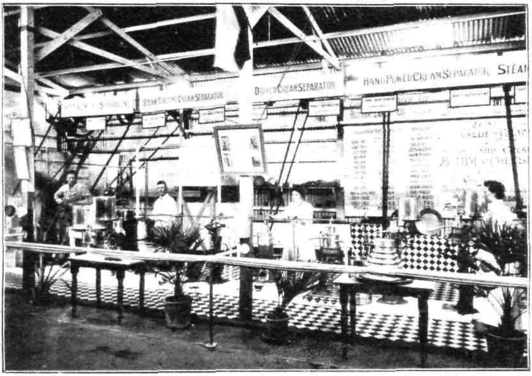
A table of figures shows the value of the industry for the past year, whilst still another indicates the growth of the export trade since the season 1889-90, when a start was made by exporting £51,300 worth of butter, to 1900-1, with a total value of £1,664,790.



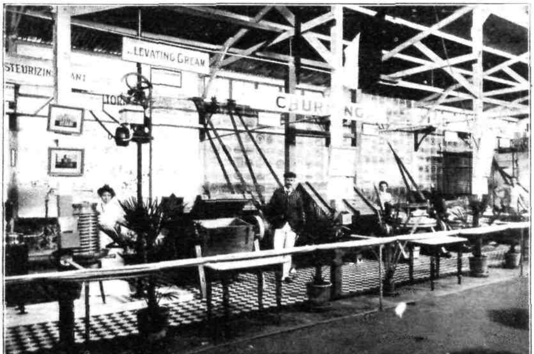
Department of Agriculture's Annexe, Gold Jubilee Exhibition, Bendigo.

It is in the appliances used for the manufacture of butter that the greatest progress has been made. Electricity and steam provide the necessary power and heat for the dairy. Through the medium of a 5 h.p. electric motor all the shafting and belt-driven machinery is worked. A Tangye colonial type 6 h.p. boiler drives the turbine machines, and supplies heat for pasteurizing, &c. As the separating of milk does not take place till the afternoon, it is all run over a Primus

cooler when received, and then placed in a cool room, after samples have been taken for testing acidity and butter fat, in either the Facile, Turbine Babcock, or the New Ideal tester, which is propelled by the same



means. A Crown milk elevator is used to raise the milk into the receiving vat, from which the milk flows to the cream separators



through a Primus pasteurizer, which is made to serve the purpose of a heater, in order to bring the milk up to 85° Fahr. for separating.

There are half-a-dozen separators of different sizes and types, representing the Crown, De Laval, and Melotte makes. The milk heater delivers through a silver-plated pipe and taps to any or all the separators at the one time. The cream flows from the separators into a Paasch pasteurizer, and then over a cooler into a cream elevator of the same make, which conveys it direct into a cool room, where it is ripened ready for churning. The churns consist of a 60 lbs. Gisborne and another of the same type 600 lbs. capacity.

Two Gisborne butter-workers, capable of treating 224 lbs. and 56 lbs. are used. The butter is put up in pound and half-pound rolls with a Eureka butter-printer.

All the water used in the dairy is filtered by means of an Abbott high-pressure filter, worked by a direct-acting steam pump, and cooled to a low temperature in insulated tanks by means of two refrigerators.

An Atlas refrigerator, as well as cooling the water required, maintains a low temperature in a chamber insulated with ruberoid and dead air spaces. The walls of this cool room are covered with opalite tiles. A Humble refrigerator makes ice, and keeps a chamber below freezing point, in which are kept samples of all kinds of perishable produce. A glass front to this room permits the exhibits being seen at all times without opening the doors.

Mr. P. T. Peppard, assisted by Miss G. Anderson, is in charge of the dairy.

CREAM TESTING.

By H. W. Potts.

The steady increase in the adoption of home separation in Victoria has rendered the accurate estimation of butter-fat in cream of wider significance and greater commercial importance.

The following extract, taken from the report of the Butter Board, and issued in August, 1900, shows the extent to which this phase of our dairying industry has expanded :—

Proportion of Butter produced from Private Separator Cream.

"It has not been possible to accurately estimate the proportion of butter made from cream separated on the farms. We have, however, met with private separators in every district visited by us, except on our western tour; and we are informed that they have at last gained a footing even in the Western District. In some places we found they were universally used, and that the separating of cream at the factories had ceased. Their rapid spread through the country in recent years is shown by the following statistics supplied by the Government Statist :—

CREAM SEPARATORS USED ON FARMS, ACCORDING TO THE AGRICULTURAL STATISTICS

1886	33
1887	58
1888	108
1889	155
1890	238
1891	445
1897	2,125
1898	2,799
1899	3,446

This year the number of private separators in use must be about 4,100 From these figures an approximate idea of the proportion of butter made from private separator cream may be obtained. According to another return furnished to the Board by the Government Statist, there were in Victoria 10,498 farmers supplying milk or cream to butter and cheese factories or to creameries in 1899. About 500 of these may be taken as supplying milk for cheese making; so that out of a total of 10,000 supplying milk or cream for butter making, there were 4,100, or 41 per cent., who separated the cream on their own farms."

However deplorable this may be, the fact remains that cream is now being largely purchased at our factories direct from the farms; and the method of purchase requires to be as keenly scrutinized as that employed in dealing with milk.

In a few instances the suppliers of cream adhere to the old notion that the churn will give the truest returns of butter, on which payment ought to be based, ignoring the numerous possibilities of waste or loss in ripening, churning, working, incor ect temperatures, &c., which obscure the true basis of payment. As a result of lengthened experience in the application of the Babcock method of estimating the butter-values of cream, there can be no question as to which method is the more accurate, economical, and fairer alike to vendor and purchaser.

It may be said that, given a careless or dishonest operator with the tester, the returns can be rendered equally unsatisfactory as with the butter-maker. That may be so ; but a review of all the points to be strictly observed in the manipulation of the two processes of arriving at just returns, no doubt can be raised as to the advantages possessed by the Babcock system. There is a much less possibility of error creeping into the estimation of butter values by the latter, than by the butter-maker with his churn.

There are several conditions associated with home-separated cream responsible for wide variation, and it is a duty to reduce these to a minimum in the effort to arrive at the closest approximation to accuracy. It is therefore proposed in this paper to deal with several phases of cream testing the writer has found necessary to guide those engaged daily in this important work.

It is not proposed to encompass the whole subject of cream testing, for the reason that the general directions issued remain unaltered. It is only on such points as have been found weak in practice and in which suggestions are made to meet prevailing conditions.

The Sample.

It is fully recognised that the first consideration is to secure a correct representative sample. This is the most potent feature in both milk and cream testing. No pains should be spared or no detail neglected, to effect this. Every one engaged in the work of cream testing is cognizant of the changeable state in which cream arrives at the factories and the difficulties attendant on getting an equable sample. Out of the numerous methods employed we may select one that has been severely tested, and afforded us sound proof of its usefulness. This is the glass tube of ½-in. diameter, and long enough to reach the bottom of the ordinary cylindrical cream-can. The tube is fitted with plunger attached to a stiff wire. It is held on the surface of the cream with the right hand, the plunger-wire grasped firmly with the left, and the tube lowered into the cream, whilst the plunger is maintained stationary. A column of cream is thus taken typical in character of the whole can. With a piece of clean butter-cloth, on drawing the tube, the adherent cream is swept back into the can and the tube contents forced by means of the plunger into a clean composite sample bottle or delf cup ; the former should be preferred.

Preserving the Sample.

Cream collected in a wide-mouth bottle fitted with indiarubber plug, will retain its freshness longer than milk. Under some circumstances, however, it is found necessary to preserve it ; then one or two drops of pure formalin may be added to the bottle after washing it, taking care to promptly insert the rubber plug.

Should the cream samples be found thick or viscid, just prior to testing, they may be liquefied by immersing them in a water bath at about 100° F. for a few minutes. Then by gentle agitation a homogeneous sample can be got.

To Measure or Weigh the Sample.

The caution given already may here be repeated to obtain a true sample. Having the purpose clearly in mind the operator must approach this stage with the distinct conception of the possibility of error.

First, the physical conditions of the cream have to be determined to decide what method to adopt to insure that the portion taken from each to test exactly represents the bulk quantities supplied.

Given a cold sample of sweet, thin, cream ranging in fat-value from 25 to 30 per cent., the pipette measuring 8·75 c.c. may be used, followed by rinsing it with an equal quantity of warm rain water to mix with the cream. This class of cream, however, is the exception and not the rule in our warm climate where the farmers are situated long distances from the factories. Sour cream containing greater percentage of fat is more viscid or thicker, and several difficulties are encountered when attempting to take a sample with the pipette. It is a trouble to wash out the cream left in the pipette into the flask. More water is used, with the result that the acid added afterwards is unduly weakened, and the test rendered almost valueless. A source of error is the incorporation of air, also the retention of generated gas at some stage or other in dealing with the cream; and when measuring the sample in the pipette these imprisoned air or gas globules occupy space credited to cream in the results. For example, during the process of separation countless globules of air become intermixed with the cream, and the thicker it is the greater the number.

In the course of time these escape. It is owing to this that the erroneous popular belief has arisen amongst dairy farmers that the longer cream is kept the richer it becomes in butter-fat. It simply arises through the cream containing less air, and hence the pipette measures more cream. With the adoption of weighing the sample this source of error would disappear. This occurs also when thick cream is being stirred, and again when the sample is being shaken prior to testing. How much air is thus enveloped it would be a matter of inconvenience to arrive at, but the difficulty is completely avoided by weighing the sample.

Another means of preventing accuracy by the use of the pipette is the constantly varying specific gravity or weight of creams. No pipette will measure out the same weight of creams of different fat contents. The richer the cream, the lighter it is. Here it ranges from 25 to 55 per cent. In an ordinary day's testing at a factory dealing with home-separated cream, a dozen different fat-values may be found, and yet the pipette is used in measuring the lot. The lighter the cream the less the weight will be delivered by the pipette into the test flask; or, in other words, it must be remembered that no pipette will measure out the same weight of cream of different degrees of richness.

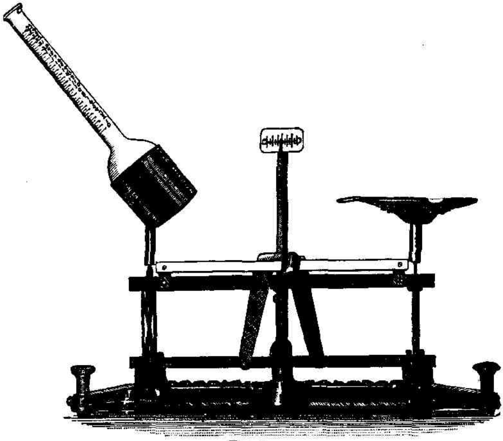


FIG. 1.

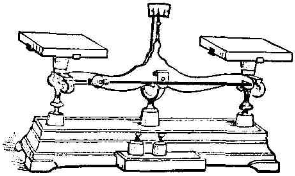


FIG. 2.

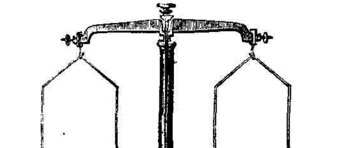


FIG. 3.

The Scales or Balance.

During the past few years considerable attention has been centred on this phase of dairy work, more particularly in the United States, where home separation is largely followed. Farrington, Woll, Bartlett, Eckels, Webster, Fitch, and others have furnished ample evidence on this question. This experience is largely confirmed in many of our own factories dealing with this class of cream.

Amongst the most useful, convenient, and easily-adjusted scales or balances in use is that illustrated as Fig. 1. It is known as the Stringer Torsion Balance, and was designed by Professor Bartlett, Chemist at the Maine Agricultural Experiment Station. The beam and pans are supported on flat steel spring wires, and this does away with knife edges, which are so liable to corrode as well as wear. The delicacy of movement and sensitiveness are retained. It is about 10 inches long and 7 inches high, and sufficiently balanced to weigh accurately ·05 gramme. The left pan is constructed as a pocket to support the flask at sufficient angle to avoid any cream dropping on to the balance, the right pan being used for carrying a counterpoise and weights. A side beam is attached on which a movable weight or counterpoise is employed to balance in a rapid way the empty flask. A piece of metal, such as lead, might be also used to permanently balance the flask. Above and in the centre of the beam is a graduated scale which assists the operator to ascertain the true balance. The pans can be locked or arrested by means of a device attached to the base.

This balance ought to be permanently located on a firm, level, suitable stand or table free from any movement in the floor or building likely to create oscillation or jarring. Get the balance level by means of the adjusting screws; use the sliding weight on the beam to obtain an even balance. To this end watch the indicator on the scale, and when this vibrates equally on each side of the centre line on the scale the true weight is arrived at. After balancing the flask, add the 9-gramme weight to the right-hand pan and add sufficient cream with the pipette to balance. Add 9 cubic centimetres of rain or distilled water.

Each flask must be separately balanced.

Figs. 2 and 3 represent other balances used for a similar purpose, any of which may be purchased in Victoria.

The Flask.

Seeing the result, when 9 grammes of cream are used, has to be doubled to get the butter-fat percentage, any error is proportionately increased. The usual cream flask in use, such as the Winton, only gives a reading to half of 1 per cent., or ·5, whereas the Bartlett flask shows a reading as fine as ·2 per cent., or one-fifth of 1 per cent., and renders it possible to arrive at a closer reading.

Clearing the Tests.

One of the complaints made by testers is that the columns of butter-fat in the flask necks are cloudy. This can be overcome by cooling the flasks in a water bath to below 60° F., replacing them in the machine, and whirling for two or three minutes.

Reading Off.

Since the introduction of the steam centrifugal machine it has been frequently found that the readings are high, and this arises from the greater temperature at which the flasks are whirled by the aid of steam. The addition of a thermometer to the lid of the machine, with the bulb inside, is a guiding agent in overcoming this trouble. Readings should not be made above 140° F., or below 120° F.

CLEAN CANS.

By P. J. Carroll, Dairy Supervisor.

At the majority of factories and creameries visited since my appointment as Dairy Supervisor I found a large percentage of cans in use totally unfit for dairy purposes.

In the interests of the suppliers as well as the industry it would be a distinct gain if strict measures were adopted to prevent the use of those rusty, dented, and worn-out utensils.

It must now be patent to every dairyman that milk is a most delicate and changeable article of food, and when exposed to such infective or contaminating influences the commercial value of such food, as well as its wholesomeness, is unmistakably reduced.

Rusty cans are a constant menace to the industry and source of daily anxiety to the factory and creamery manager, as it also ought to be to the supplier. Unfortunately the latter will not always recognise this. An examination of a rusty patch in a milk can discloses an unsavoury condition of affairs. Rust creates a sponge-like or honeycombed state in the texture of the iron. In the numerous interstices are lodged casein which provides food for the growth of various families of objectionable and putrefactive organisms. From these emanate an infective or putrifying series of ferments which are distributed throughout the milk or cream stored in the can. This rusty condition further provides a peculiar chalybeate or rusty iron flavour in dairy products, whether it be milk, cream, cheese, or butter. The lactic acid generated in the milk attacks the iron, combines and dissolves it, thence the permanent flavour referred to. Here we have a double action, false flavours imparted by micro-organisms and the ferments resulting from their action, as well as the flavour imparted by a solution of the iron rust. It naturally follows that where the use of rusty cans is permitted, not only is the supply in the cans themselves affected adversely, but also the whole supply each morning in the general receiving vat. Again the question of detached particles of rust has to be considered, and whilst this does not occur frequently, yet we occasionally have evidence of such in the butter. It is a matter of urgency that all cans showing rust in the bottoms be sent to the tinsmith to have them renewed. Where the body of the can is also affected it is better to reject the can and provide a new one. The useful age of a can might be largely prolonged if ordinary precautions are adopted to prevent rust. No more effective means can be recommended than the use of a $\frac{1}{2}$ per cent. of boiling solution of ordinary washing soda (1 lb. of soda to 20 gallons of boiling water). Care must be observed to see that the solution is boiling. The use of this is beneficial in two ways, first by acting as a wholesome and innocuous germicide or microbe-killer, and next as a preventive of rust.

Another objectionable and dirty practice that comes under our notice is the daily use of rags and cloths to secure the lids of the cans firmly. In a well-made can with sound lid there is no need for them.

Further, should the lids become ill-fitting through careless use and other causes, the tinsmith would, at a very small cost, remodel the rims and render them serviceable. I am led to believe that such conditions could be remedied if a better system were permitted on the receiving platform, and the manager of either factory or creamery empowered by his board of directors or employers to reject milk brought in rusty cans, or where the lids are stuffed with ill-smelling rags. It may happen that the first supplier to be brought under the lash of such a regulation would be the chairman or a director, but it should be honestly remembered that the existence of co-operative effort depends on the wholesome principle that all must be treated alike, and the first to applaud the manager should be one who is placed under such circumstances and justly recognises the endeavours of the manager to apply this excellent principle. Delicate, doubtless, the duty is to the manager, but a tactful concern for the success of his company must pervade his actions throughout.

When the cans return to the farm and the skim milk has been unloaded, the first duty of the dairyman is to promptly attend to the *cleansing of these vessels. Milk contains a proportion of albumen* (white of egg), and to throw in a bucket of hot water into the can, as it often happens, means attaching the albumen to the sides, there to remain and become a menace to the next can of milk. Cold water should be used first to rinse out the milk slops, followed by boiling water, or a boiling solution of washing soda made the strength recommended before. Great care should be observed in finally rinsing the cans with water that has been recently boiled. The water supplies at many farms are highly impregnated with hostile bacteria or organisms, and boiling destroys their vitality. Where steam is available, it is unquestionably a most valuable cleansing agent. The cans should be inverted on a raised platform, exposed to sunlight, away from smells, and where there is no floating dust.

The interiors should be frequently examined to detect any flaws in the seams; these, with dents, are a constant source of false invasions in milk, and are equally as dangerous to the sound keeping qualities of milk as rust or dirty rags around the lids. In cleansing a can, the objectionable practice of using cloths or rags ought to be avoided; only a sound good brush ought to be used in scrubbing a can, and with a liberal allowance of "elbow grease."

In concluding this article I make a strong appeal to boards of directors to support the managers in the execution of a duty which is frequently unpleasant, and doubly so when there is a tendency to dirty conditions in delivery. Strict supervision in the receiving loft means a higher grade product and greater profits.

When the cans are stowed away for the winter, see that they are well cleansed and smeared over the whole surface inside and out with vaseline. Milk or cream cans should never be used for any other purpose.

A BRIER AND BLACKBERRY BUSH ERADICATOR.

By H. W. Potts.

The introduction of brier, dog-rose, and blackberry plants from Europe has been followed with the usual results, where the growth of such vegetation has been permitted to spread, neglected, and without proper control. In many parts of the State a nuisance has been unmistakably created; large areas of valuable land are overrun and rendered useless. It is especially observable on the rich soils of South Gippsland, where climate and rainfall are favorable to their development, and splendid land is occupied by a non-productive class of scrub. Under ordinary conditions unremitting labour is involved in uprooting this tenacious and unapproachable form of undergrowth. A few years ago a happy idea occurred to the manager of a South Gippsland butter factory. At the ordinary weekly testing of the suppliers' milk samples by the Babcock method, a quantity of sulphuric acid is employed, as much as half-a-gallon in many cases during the day. When the tests are completed a quantity of partially-exhausted sulphuric acid is left in the flasks, and the usual practice is to throw it away. The practical mind of the manager in question suggested the utilization of this waste product in the direction of killing briers and such like. The factory paddock of 4 acres was wholly occupied with this growth. He experimented on it by throwing half-a-pint of the waste sulphuric acid so as to flow down the centre stem of the plant to the main root. In the course of a few days each bush withered, became dry, and formed a mass readily destroyed by fire. In six months the paddock was cleared with the greatest ease, and the manager now enjoys the privilege of grazing a horse in a paddock formerly taken up by this impenetrable thorny and useless scrub. Hundreds of gallons of sulphuric acid are allowed to go to waste yearly at our butter factories, and in numerous instances this might be collected in demijohns or Winchester quart-stoppered bottles and distributed to milk-suppliers with suitable directions and precautions, to act as a blackberry and brier destroyer.

VITICULTURAL BRANCH.

THE RELATIVE MERITS OF CEMENT AND WOODEN VATS IN WINE-MAKING.

By R. Dubois, B.Sc., F.C.S.

Both wooden and cement vats are used for the fermentation of wine in Victorian cellars, and the use of the latter tends to become more general, although their invention is rather of recent date.

The two important questions for Victorian wine-makers is to know if the old wooden vats are to be preferred to cement ones, and if open vats are better than closed ones for the fermentation of wines in warm districts.

This question has been studied and solved by Professor Dr. Antonio Fonseca.* His results were translated in French by Gaston Lavergne, and published in the *Revue de Viticulture*, from which we extract the following† :—

Experiments of 1893.—These were made at Carignola, in the cellar of Mr. Paroncelli. Six vats were used, three made of cement rectangular in shape, with the angles rounded inside, of about 1,000 gallons capacity, and three wooden ones, of same height, shape, and capacity. Two vats in each group were left opened at the top, one of these having a false head at about four-fifths of the total height, and the third one closed completely, with the exception of the man-hole at the top. They were numbered as follows :—

Cement Vats.	Wooden Vats.
No. 1	No. 4 opened at top without false head.
No. 2	No. 5 ,, with false head.
No. 3	No. 6 closed at the top.

On the 10th October the six vats were filled with black grapes, passed to a crusher first, and afterwards crushed with the feet.

The crushing was finished at 11 a.m., and the crushed vintage distributed evenly through the six vats. The percentage of sugar was found to be equal to 21·50 grammes in each vat. In the afternoon of the 11th October, and twice during every day following, the mark was rammed down in vats No. 1 and No. 4. The must was at the same time pumped overhead in vats No. 2 and No. 5. The temperature of the air in the cellar and of the must in the vats was ascertained twice a day, with the following results :—

1st. The maximum temperature of must and head of mark was reached in the wooden vats.

2nd. The fermentation reached its maximum of intensity sooner in the wooden vats.

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* Le Stazioni sperimentali agrarie italiane. Modena, 1896. Vol. XXX. fasc. 1.
† *Revue de Viticulture.* Vol. VIII., p. 252, 1897.

3rd. The temperature reached a higher maximum in the closed vats (comparison between closed and opened vats).

4th. Comparing the fermentation obtained with the immersed heads and pumping overhead, and with the floating heads rammed at regular intervals. The fermentation was more complete, and took place more regularly in the first case.

On the 17th October each wine was racked into a 135-gallon cask, keeping the "press" wine apart from the "goute" wine. At the end of November the twelve wines were analyzed, with the following results :—

I.—Goute Wines.

No.	Alcohol, per cent. in vol.	Dry Extract.	Glucose.	Total Acidity.	Cream of Tartar.	Volatile Acids.	Colouring	Intensity.
1	12·98	43·98	7·14	5·47	3·39	0·420	85 III.	V.R.
2	12·87	39·80	5·58	4·72	3·39	0·430	90 V.	V.R.
3	12·87	44·34	5·64	5·25	3·58	0·412	83 II.	V.R.
4	11·35	73·60	24·13	5·32	4·42	0·466	70 II.	V.R.
5	11·52	65·06	21·50	5·40	4·24	0·454	70 I.	V.R.
6	11·52	63·16	21·30	5·40	4·35	0·450	75 II.	V.R.
				II.—Press Wines.				
1	12·96	37·48	1·60	5·62	3·70	0·508	...	
2	13·05	41·68	1·28	5·47	3·39	0·484	...	
3	12·96	42·76	1·65	5·47	3·82	0·496	...	
4	12·24	66·84	17·84	5·77	3·64	0·492	...	
5	12·15	60·12	17·84	5·70	3·26	0·520	...	
6	12·05	64·48	18·21	5·62	3·46	0·532	...	

These analytical results may be interpreted as follows :—

1st. Wines reached a higher percentage of alcohol in the cement vats, the difference being important.

2nd. The glucose is found in inverse proportion to the alcohol, the difference being also important.

3rd. The percentage of dry extract was greater in the wines fermented in the wooden vats ; the difference seems at first very large, but becomes less noticeable when the sugar is deducted.

4th. The percentage of total acidity was larger in the wines fermented in the cement vats. Volatile acids and cream of tartar were in larger proportion in the wines fermented in the wooden vats.

5th. The colour was in every case more intense for wines fermented in the wooden vats. However, the colour of those fermented in cement vats belonged to the same group of violet-red of the scale of Chevreuil, and, although lighter, the colour was of a better nature.

All these analytical results were confirmed by expert tasters both in and outside the wine trade. The wines fermented in cement vats were found more alcoholic, drier, sounder, more acid, brighter, more agreeable to the palate, and better matured.

Professor Dr. Fonseca, recognising the great practical importance of this first experiment, did not publish these results until he had checked them a second time. He made new experiments in 1894 in the cellars of Frederico Balsamo at Brindisi, and in the cellar for official experiments at Barletta. The results in this case were similar to those obtained at Carignola in 1893.

From this, Fonseca concluded that cement vats are in every way superior to wooden vats for wine fermenting. But Dr. Fonseca adds—"The greatest care must be brought to bear in their construction, dimensions, and coating, and further sound methods of fermentation should be adopted if we are to avoid failures."

Cement vats have given excellent results in Victoria: all viticulturists who have used them will agree on this point. Their capacity varies between 400 and 1,200 gallons; the inside walls are coated with polished cement and paraffine wax is run into cement with a plumber's lamp. This method of coating the cement which is opposed by some authorities can have but good results: it prevents the lime always contained in cement from neutralizing the acids of the wine, and at any rate can do no harm. However, the same result may be obtained at less expense by washing the inside of the vats with a solution of sulphuric acid at 5 per cent., this destroys all the lime on the surface of the cement, which could have any action on the wine. It is only necessary to do this operation once after the vats are built and ready for use, whereas the paraffine coating has to be repeated every two or three years, a part of the paraffine being mechanically removed or melted away during the fermentation. Cement vats are also used for the storage of wine. In this case it would be advisable to coat the inside with china or glass tiles, as is the practice in Algeria.

The St. Gobain Company manufactures for this purpose glass tiles 4 to 6 mm. in thickness and 24 cent. by 24 cent. For round surfaces, smaller tiles are used, 12 cm. by 12 cm. The side which is against the cement is striated to allow the cement to take; the other side is smooth.

For the floor of the vat, vignerons generally use larger tiles, 50 cm. by 50 cm., and 11 to 12 mm. in thickness.

These tiles are laid on the soft cement mortar, being careful not to allow any air to remain between the cement and the tile. The tiles should be soaked in water before using. Enamelled earthenware tiles are also used, but from the point of view of resistance, glass has the following advantages:—

1st. Glass tiles are larger and the joints less in number.

2nd. The edges are very neat, and the joints reduced to a very thin line.

3rd. They have no action whatever on the acids of the wine, while the terracotta tiles are coated with a leaden compound, very alterable, dangerous to health, and scaling easily.

The price of glass coating varies with circumstances, locality, shape and size of vats, &c. ; it ranges between ½d. and 1d. per gallon.

The floor of vats should have a fall towards a small pit placed in the centre of one of the corners ; this enables the drainage of the last particles of must which have to be taken out of this pit with a dipper (Fig. 1). It would be a decided advantage to adopt the Algerian

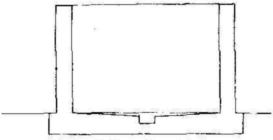

Fig. 1. Ordinary Cement Vat.

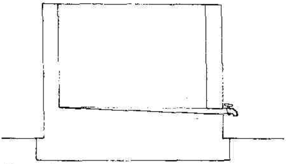

Fig. 2.—Cement Vat built after the Algerian method.

method consisting in having the floor of the vats raised 1 foot to 18 inches above the floor of the fermenting house, and a brass tap 2 inches inside diameter through the wall of the vat, the floor of the vat falling towards that tap (Fig. 2). A grating is fixed over the opening of the tap inside the vat to prevent it from getting choked with stems or berries. A small gutter might be made running along each row of vats with a fall towards a small tank sunk in the floor at one end of the fermenting house. By opening the tap at the bottom of the fermenting vat, the wine would run into the small tank, and from there be pumped into the storing vats.

A very important point with regard to fermentation in Victoria is to prevent acetic fermentation during vinification. It is well known that the head of marc is a centre for the development of acetic germs, and it should not be allowed to remain in contact with the air. It is for this reason that most authorities advocate the submersion of the head. This system of fermentation has been adopted by several vine-growers in Victoria, and they are satisfied with the good results derived from its adoption. The head is maintained sunk into the must by planks kept down by different devices. (See Figs. 3, 4, and 5).

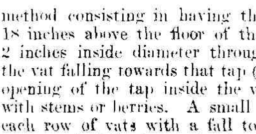

Fig. 3.

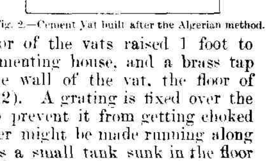

Fig. 4.

Unfortunately the majority of wine-makers do not avail themselves of this practice, and are contented to ram the head down at regular intervals. This is not sufficient, and has the other disadvantage of requiring the constant attendance of a man ramming the vats one after the other.

Mr. Trottier, engineer, at Fondouk, in Algeria, has invented a clever modification of the usual method of sinking the head. He maintains the marc at the bottom of the vat instead of near the top as is done at present.

Wine-makers cannot fail to see the striking advantages of such a method. It places the head of marc, centre of production of maximum heat in the region where the coldest must flows naturally by gravity owing to its greater density.

On the other hand the application of this method forces a perfect aeration of the vintage, as the must has to be pumped out of the vat after the crushing is over, to allow the fixing of the marc at the bottom and pumped in again over that mark.

Four strong rings are bedded in the floor of the vat at the four corners, and when the marc has settled at the bottom a strong net is thrown over it and secured to the four rings. (Fig. 6.)

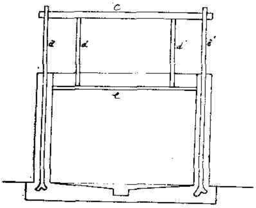

Fig. 5.

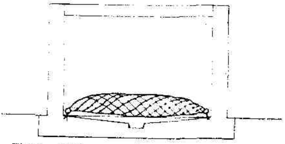

Fig. 6.—Netting secured at the bottom of the Vat to keep the marc submerged.

(To be continued.)

THE NEW VINEYARD.

(An Answer to Certain Statements in the Viticultural Report of the British Consul in Bordeaux for the Year 1900.)

By R. Dubois, B.Sc., F.C.S.

The success of reconstituted vineyards, that is to say, of vineyards grafted on vines resisting the attacks of phylloxera, is now such a well-established fact that it has become a commonplace statement. The culture of the vine may be pursued, notwithstanding the presence of phylloxera in the ground, and with the aid of grafting it is possible to preserve varieties which have made the fame of wines, such as Chateau Margaux, Chateau Lafitte, Chambertin, &c., &c. When phylloxera made its first appearance in Europe in 1863,* vignerons would not believe that such a deadly disease existed in our midst, and when they later on awakened to the fact that it was necessary to guard the vineyards against total destruction, different means were used. Some with great tenacity tried to preserve dying relics, or, according to Foëx, "preserve the vine in the state of a patient which was to be doctored all his life," and made the fortune of merchants of carbon bisulphide; others better inspired sought a remedy in varieties which were not affected by the insect.

Controversies became sharp between Sulphurists and Americanists, and continue up to the present day, especially where phylloxera appears for the first time.

One of our daily papers, together with the *Australian Vigneron*, have quoted Mr. Bellot des Minières' views as expressed in the Diplomatic and Consular Report, No. 2612, of the British Consul in Bordeaux for the year 1900, which runs as follows:—"If the Australians imitate the Russians † by planting vines grafted on American stocks, and also by treating them with lime and copper washes, they will succeed in producing, as the Russians have done, wines which they can neither drink nor sell."

As this statement seems to have caused some missapprehension among vignerons here, we shall show that American vines are a decided success both from the point of view of the amount of crop, and the quality of the resulting wine. The *département* of the Hérault in the South of France produces more wine than any other *département*, and, in fact, more wine than any other equal area in the world. Of the 453,000 acres of vines grown there in 1899, 445,435 acres were grafted on resistant stocks (Riparias and Rupestris mainly), and the crops obtained per acre now, are larger than were obtained before the advent of phylloxera, when the vines were on their own roots.

* G. Foex, *Cours complet de Viticulture*, 3e edit., p. 600.

† Mr. Bellot des Minières might have added the French, Spaniards, Italians, Austrians, Germans, Swiss, Californians, vignerons of Cape Colony, Roumania, Hungary, Portugal, &c., &c.

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)uring the period of greatest wine production in the Hérault ,5–1874), the mean annual yield was 336,000,000 gallons, while ng the period when the effect of phylloxera was at its maximum '0–1890), *the mean annual yield was only* 93,000,000 gallons.

'he wine production for 1899 and 1900 has averaged 315,000,000 ons.* This corresponds to a crop of 4·7 tons of grapes per acre 53,000 acres; if we reckon 150 gallons of wine equivalent to 1 ton 'rapes. This is a very large crop if we consider that it is the age of the whole district, and includes all vines, both young and

A comparison of these figures with the viticultural statistics of oria *will show emphatically that the growing of vines on resistant* is a success from the point of view of the amount of crop obtained.

'he average production of Victoria, according to the most reliable stics obtainable,† during the decade 1891–1900 has been 1,901,132 ns, and the area under vines has been estimated at 28,495 acres ll bearing.

'his, calculated on the basis of 150 gallons equivalent to 1 ton es, represents exactly an average crop of 1·5 tons per acre, which not *compare very favorably with 4·7 tons per acre yielded by* vines of the Hérault, of which 97 per cent. are grafted on ;ant roots.

he complete reconstitution of the vineyards of the whole of that ict on resistant stock has taken place in less than twenty years, h is a very short time when we consider the delay caused by rous mistakes which were unavoidably made in the beginning.

Vith regard to the quality of the wines obtained, we cannot do r than quote the views of one of the most reliable authorities in ce. In the following extracts‡ Viala states most emphatically the quality of the wine is even improved by grafting:—

At the beginning of the reconstitution of vineyards with American , peculiar ideas were formed as to the effects that would result they were grafted with European vines. It was said, for instance, red varieties could not be grafted on white kinds (for example, r), and especially that French grafts made on Labrusca, Candi- Riparia, &c., would produce wines with a foxy, acrid, or harsh The numerous experiences known by agriculturists and arbori- rists should have at once condemned that opinion; and facts have proved it erroneous.

is now admitted, without dispute, that wines produced from d vines are not only of equal, but of appreciably superior quality icularly in alcoholic strength) to those produced by the same ies when not grafted. This superiority is due, in most cases, to rlier ripening of the grapes, as will be explained later on.

These are the figures given by the *Moniteur Viticole.*

These statistical records were very kindly furnished to me by Mr. Fenton, ment Statist.

P. Viala and L. Ravaz. *Les Vignes Americaines,* 1896, p. 278; translated by ois and W. Percy Wilkinson.

But for the finest wines (*grands crus*) the influence of grafting is still disputed. Some people doubt if, in the districts producing the finest wines, the grafted vines yield as perfect a quality as that obtained before the reconstitution by American stocks, and, for example, that the grafted vines require excessive manuring, and that this treatment, though raising the quantity of wine produced, must indirectly diminish its quality. We have said on several occasions, and the fact is now well known, that some American vines are not more exacting in the matter of fertility than the European varieties. And again, numerous comparisons that have been made in the vineyards producing fine wines (Burgundy, Beaujolais, and Medoc) have fully proved that the quality of the wine from grafted vines is equal, if not superior, to that from non-grafted vines. It is evident that, in order to arrive at a serious deduction in the comparison, the fact that old vines give wine of a superior quality to young vines must be taken into account. Conclusions on this point are only of value when the wines compared have been made from vines of equal age, the same variety, grown in similar soils, and submitted to the same methods of culture.

We know, and it is a classical fact, that grafting generally improves the quality. The varieties of the pear, peach, apple, &c., when grafted, bear more luscious and sweeter fruit than those which have not been grafted, and grafted vines form no exception to this general rule. In the Beaujolais, grafted vines eight, ten, and twelve years old, give wines equal, if not superior in quality, to those produced before the phylloxera invasion by vines of the same age. In the Blayais, comparisons of the wines from grafted vines eight or ten years old have been made with great care; the wines produced are of high quality, and do not concede any points to those made formerly. The same may be said of several vineyards (*de grandus crus*) in the Haut and Bas-Médoc, and also of the Saint-Emilionnais, the Libournais, Ermitage, Côte-Rôtie, Côtes-du-Rhône, Chateau-neuf-du-Pape, Nerte, Saint-Georges (Hérault), where comparisons of the wine from grafted and ungrafted vines five to sixteen years old have been made. *Everywhere, and without exception, the quality has been maintained if it has not even been found superior.*"

The Americanists, who have now won the day, started from this very simple and rational idea.—There is somewhere some species of vines which do not succumb to the attacks of the insect, as, if phylloxera destroyed all species of vines, it would very soon destroy its own food and would disappear from the surface of the earth, and this would have happened long ago.—Thus, new species of vines were found in America, the natural habitat of the phylloxera. (It is a well-known fact in agricultural entomology that insects only become pests when transported in new lands and allowed to live on varieties differing from those upon which they naturally fed. The Arab of the desert lives quite comfortably with parasites which would incommode us.)

It became necessary to select from the 18 known botanic species of vines of America those which would adapt themselves better to the European soils and climate. This selection has been made, and we

are therefore in a position of advantage here, as we can learn from the mistakes and successes of the past twenty years of trial and experimentation, and can at present plant a vineyard on resistant roots with as certain a prospect of success as is possible in any agricultural venture. We have, of course, our own peculiar difficulties of soil and climate, and it will be the endeavour of the Viticultural Experiment Station, at Rutherglen, with the help of the District Experiment Stations, to solve the questions entailed by these conditions.

We do not wish to convey the impression that establishing a vineyard on resistant stocks is all plain sailing. To do it successfully requires a certain amount of knowledge and skill which every one does not possess. This, however, is far from a disadvantage. Any business that is "as easy as falling off a log" is sure to be unprofitable, as everybody who has skill enough to fall off a log is liable to rush into it.

I would urge, therefore, those who contemplate planting vines either for wine or table-grape purposes to read what literature they can find on phylloxera and resistant stocks, and profit by the experience of those who have successfully re-established their vineyards in other parts of the world.

AMERICAN VINES.*

America is the part of the world which possesses the greatest number of species of vines ; the numerous types derived from them are disseminated in all situations and conditions. Eighteen species of American vines at least are known, while only one exists in Europe, and eleven in Asia. The species from America alone resist more or less the attacks of phylloxera, and this resistance is probably the result of natural selection determined by the action of the parasite itself. This natural selection is, therefore, a guarantee of the permanence of the resistance acquired by each of them.

Amongst the eighteen species of American vines, a few only are of cultural value for our vineyards. It is not useless, however, to know them all, for certain species of no intrinsic value have given, by direct or indirect hybridization, cépages which have or have had a certain reputation.

Vitis Monticola.

Description (General Characters).—Stump little vigorous, semi-climbing habit, trunk slender ; wood of the year ramified, shining, of light-brown mahogany colour (see the accompanying plate), much striated, tendrils discontinuous. Leaves small, as wide as long, sub-cordiform, almost entire, slightly folded along the mid-rib ; petiolar sinus deep, with overlapping sides ; teeth blunt, obtuse, normal to the limb, which is thick and slightly undulating (bubbly) ; upper-face deep green, shining ; under-face lighter green, as if varnished ; young leaves rosy green. Bunch small, berries sub-medium, spherical, black or deep grey, taste clean and sweet. Seeds medium or large, sub-spherical ; beak short and thick ; chalaze sub-orbicular ; raphe in the shape of a very prominent fine cord, distinctly separated from the chalaze. Roots hard, long, fairly slender.

Varieties, Adaptation, and Culture.—Until comparatively recently only a very few varieties of V. Monticola were known, or, on account of their feeble normal vigour, were valueless for reconstitution. The recent explorations made by T. V. Munson in the extreme north-west of Texas enabled him to discover very vigorous forms in 1891, and more recently, in 1894, in a new exploration he accomplished with Salomon, jun. The varieties which they brought back, and which have been cultivated since 1893 and 1895, have a vigour and strength of development previously unknown in V. Monticola. We cannot yet pronounce an opinion on their cultural value and adaptation, but on account of their qualities of resistance to phylloxera, chlorosis, and drought, which the species and the weak forms already cultivated in France have shown, on account, also, of the dry, unfertile, and calcareous soils in which the vine grows in Texas, we may hope that

* Extracted from *Les Vignes Américaines, Adaptation, Culture, Greffage et Pépinières*, by P. Viala and L. Ravaz, translated by R. Dubois and W. Percy Wilkinson.

the vigorous forms will, in future, have a great value for calcareous and chalky dry soils. The *V. Monticola No. 1*, which has been cultivated at the School of Agriculture, Montpellier, for three years already, shows an exceptional vigour, and remains of a fine green colour in a soil liable to cause chlorosis. The *V. Monticola Salomon* resembles it in its characters, but appears to be even more vigorous.

The *V. Monticola* (V. Texana or V. Foëxeana) (Plate VIII.) occurs in a very limited geographical area in the centre of Texas, where it forms a circle in almost all mountainous country. The V. Monticola grows exclusively on low mountains, and only on the upper part of their slopes, or on the extensive table-lands crowning the hills of Texas. The climatic characteristics of these regions is an extreme drought; with a fall of temper[illegible]metimes very great in winter —20° C., and temperatures [illegible] 42° C. The V. Monticola always remains, even in [illegible] unfertile soils, of a fine green shining colour.

The V. Monticola does not grow, like V. Berlandieri, in white, chalky, soft, and friable-soils, but it grows in soils where the percentage of limestone is fairly high, and which [illegible] an analogy with the Jurassic *groies* of the Charentes, in which most other grafting-stocks become chlorosed. The soil of the table-lands of the county of Bell, in Texas, where V. Monticola is most abundant, is constituted of laminated (or bladed) fragments of fairly compact limestone, of a lithographic texture, slight yellow or whitish, with siliceous incrustations; they are intermixed with mellow blackish soil, containing numerous small fragments of soft limestone a[illegible] a few siliceous concretions. According to analyses made by B. Chauzit, one of these Texas soils contained 65 per cent. of stone and 25 per cent. of fine soil, containing :—

Clay	46·4 per cent.
Sand	3·5 ,,
Limestone	48·9 ,,

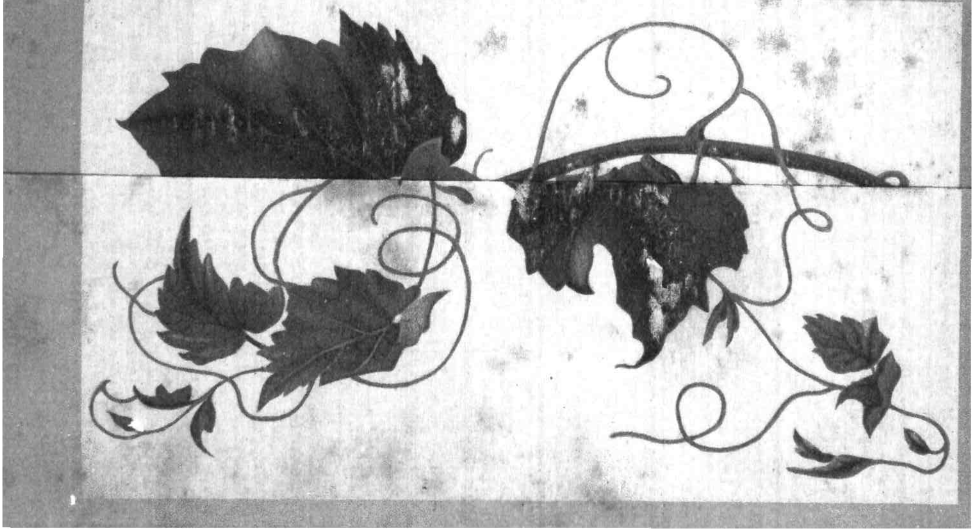
The V. Monticola has probably a very great resistance to phylloxera, and seems rather difficult to propagate from cuttings.

The V. Monticola has yielded a fairly large number of wild hybrids with the species natural to Texas, which we will study. Some viticulturists have attributed to many vigorous forms of Rupestris an hybridizing influence of V. Monticola; this seems very difficult to admit generally, especially if we take into consideration that the V. Rupestris and V. Monticola live, in their wild state, in regions very far apart.

The V. Monticola is, without doubt, an excellent element in the creation of Franco-American hybrids, especially if combined with varieties of great vigour and strong development.

The principal forms of V. Monticola selected and named in the collection at the School of Agriculture, Montpellier, are actually fairly numerous; we will only give the essential characters of the principal forms. Amongst these, the ***Monticola Salomon*** and ***Monticola Munson***

PLATE VII.



No. 1 are very vigorous, leaves intense green, canes strong and long. trunk stout. They appear to be the best, and are probably the most resistant to chlorosis.

Monticola Salomon.—Stump very vigorous ; canes strong, long ; rather numerous and erect ramifications ; internodes fairly short, finely striated, of a light-green colour in the herbaceous state, of a brownish-yellow colour with deeper stripes when lignified ; young leaves bright green, very shining ; adult leaves relatively large, entire, excessively thick, sub-cordiform, very wide towards the petiole, terminal lobe triangular, well-defined, folded along the three principal ribs, with margins irregularly rising towards the top, forming a cup ; petiolar sinus very deep, with sides tangent or overlapping ; upper-face intense green, as if varnished ; under-face lighter green, very lustrous ; ribs very stout, with fluffy hair at the points of bifurcation. Petiole very short, forming a right angle with the limb, with patches of fluffy hairs disseminated on it ; teeth short, wide, well defined, in two series.

Monticola Munson, No. 1.—Vigorous form, differing from the preceding by its leaves having irregularly and unevenly undulating margins, limb relatively thick, deep green ; numerous depressed hairs on the summit of the herbaceous shoots, giving a whitish tint to the plant.

Monticola Munson, No. 2. — This form closely resembles the preceding in the deep green tint of its foliage, and the general characters of the leaf, but is a little less vigorous.

Monticola Munson No. 3.—A form of medium vigour, characterized by the general light tint of its leaves of a yellowish-green, elongated (like an arrow barb), flat, very lustrous.

Monticola Foëxeana.—One of the first forms introduced into France ; very inferior to those previously studied on account of its small vigour ; characterized by its relatively large leaves, thick, of a deep and very brilliant green, limb undulating ; petiolar sinus almost closed ; teeth wide and very short ; wood purple-red when lignified.

Monticola Texana.—Type of the earlier introduced forms still in existence in France ; of very feeble vigour and without cultural value. Leaves small, light yellowish-green, parchment-like ; petiolar sinus open, almost flat ; teeth relatively acute.

SEASONABLE WORK IN THE CELLAR AND VINEYARD.

By R. Dubois, B.Sc., F.C.S.

We shall every month, under this heading, give an outline of the practical work which should be done in the cellar and in the vineyard during the month.

Two special articles, one on matters relating to viticulture, the other to wine, will also appear monthly.

JANUARY.

CELLAR.

Wines should not be moved or racked except in case of absolute necessity, *i.e.*, in case of diseases. It is not advisable to bottle wines during this hot month, or to send away fine and delicate wines. Casks must be visited at least once a week and kept completely full. Watch carefully wines which are liable to ferment on account of the elevation of temperature. Bottled wines placed under unfavorable conditions, more specially white wines, may on account of the heat of the season ferment, and become turbid, greasy, and acetic. If the diseases are detected in time, the wine should be taken out of the bottles, poured into a sulphured hogshead, fined, and racked as soon as it has become bright, after a week or so. This also applies to wines stored in casks.

The temperature of the cellar should not exceed 60° F. It may be kept down to a certain extent by opening the cellar doors and windows during the cool hours of the night and keeping them closed during the day.

VINEYARD.

South of the Dividing Range.—Hoeing, slashing, side dressing and topping should be finished this month. If there is any appearance of mildew, copper mixtures should be applied before the middle of the month. Powdered mixtures of sulphur and lime should also be applied this month in case of anthracnosis.

North of the Dividing Range.—A scarifying should be given to the whole vineyard, followed by a rolling with a cross-kill when available, this being the best instrument on the market for breaking lumps in stiff soils. The whole surface of the vineyard should be kept loose to a depth of 6 inches at least. The loose earth acting as a mulching prevents the evaporation of the water of the subsoil. The stiffer the soil the looser the surface must be kept. Apply sulphur if oidium appears. This applies rather to low ground near the bed of a river or creek.

Have a look over the grafts and remove the suckers growing from the stocks, and the roots from the scions.

HORTICULTURAL BRANCH.

SCHOOL OF HORTICULTURE, BURNLEY.

C. Bogue Luffmann.

INTRODUCTORY.

WITH the issue of this Journal the officers of this Branch will be enabled to set forth at regular periods the nature of their discoveries, experience, and practice, in the interest of the fruit-grower and small settler. It will, therefore, be well to at once inform those concerned, of the extent and value of present labour, and of the nature of new work which will be promptly put in hand.

The reasonable limits of Government assistance will be reached—

I. By training students;

II. By providing model orchards at Burnley where profitable methods of tree-making and management may be quickly grasped by the visiting public;

III. By providing accurately informed and competent teachers constantly employed in fruit-growing centres, dealing with soil and tree management;

IV. By providing at all general experiment stations, at a limited number of State schools and sections of private estates, small sample blocks of trees, known to be of commercial value and suited to the district; and these, cared for under the direction of the controlling head of the Division;

V. By issuing periodically, through the medium of the Journal, articles and instructions on special subjects, and ordinary routine in the orchard and garden.

II.

The standard orchards and central training ground for students will be established at Burnley. This estate comprises upwards of 40 acres of varied land, the whole of which will shortly be placed under fruiting and decorative trees and plants, and carry such feeding areas, vegetable and flower gardens, building and domestic animals as are necessary to the well-being of every rural estate. The Burnley orchards will furnish typical examples of orchard-making and management. The estate is

not well suited to the production of all fruits valuable to Victoria; but this rule may be generally applied, and whilst the work of preparing the various sites and soils is in progress, not less than when completed, the fruit-grower will be enabled to learn the specific wants as regards soil, aspect, temperature range, shape, size, and duration of profitable life normal to our commercial plants.

Such work as grubbing, trenching, subsoiling, grading, draining, manuring, and cultivating of land will be regularly carried out at the most appropriate seasons, so that visitors may acquire a knowledge of the best methods, and the average cost of operations, according to the class of material and labour employed.

From July to September the pruning of deciduous fruit trees and table and drying grapes is constantly practised, and throughout the spring and summer months further work on trees and vines in the form of disbudding, stopping, and thinning of excessive growth takes place, in order to promote, weaken, strengthen, reduce, direct, or ripen wood, as may be desirable.

The various methods and seasons of propagating and rejuvenating trees are regularly availed of. Permanent and annual vegetables and fodder crops of sure market value are skilfully grown.

Rootings, cuttings, runners, divisions, and bud and graft sticks of the most approved and valuable species and varieties of fruiting plants are distributed in limited quantities to all applicants.

Naturally, every effort is made to keep trees and plants free from injurious insects and disease; therefore, preventive means are resorted to as far as practicable; but, at appropriate seasons, the most effective sprays, washes, paints, soil dressings, &c., are applied in order to keep trees and plants clean and provide instruction for all.

The Burnley Orchard trees are for the most part old, badly made, and the soil impoverished, so that all the difficulties common to the fruit-grower who has started without experience and on a bad site have to be encountered and improved away. But, if the soil and trees can be renewed at a reasonable cost, so that health, shape, and profit will result, the value of the object-lesson must be considerable.

Not one, but various types of tree and branch arrangement will be set forth to accord with the needs of various species and varieties, and the different climatic zones, aspects, elevations, and resources of soils in which they may be planted.

The direct value of Burnley arises from its being—

(*a*) A regular training ground for students.

(*b*) A permanent source of instruction to all who look for instruction in the form of an established orchard; and

(*c*) As the surest means of enabling the State teacher to keep in close touch with his subject; set forth such methods and examples as it will prove safe for all to follow, and act in fullest sympathy with those labouring in similar fields.

For this, if for no other reason, a State orchard is a necessity. How else can the standing difficulties of the fruit-grower be fully realized and improved away?

The ordering and beautifying of homesteads always adds to their money value, and lightens the labours and anxieties of each day; hence a feature of Burnley will consist in the nature and plan of its outbuildings and other conveniences. Fruit and store rooms will be constructed on different plans to meet the resources of different districts in the matter of stone or wood, or turf, and the demands of climate. Manure-pits—indispensable to every fruit-grower—will be provided, together with such means of saving soil and moisture as experience may warrant. No spaces will be allowed to go profitless and unsightly, since it is possible that every inch can be turned to shape and use.

Shade and shelter trees, shrubs and flowers, may not be sent to market, but they have power to change a dull existence into a decent living, and, in so far as means allow, Burnley and any other institutes fostered by this Department will be made attractive and satisfying to every sense.

Burnley is, beyond question, the most favorable position for a general instruction centre, being in the heart of Melbourne, whither fruit-growers are constantly journeying; it offers advantages to a much larger number than would be possible if it were placed in any other district.

III.

It is hoped that the staff controlled at Burnley will be so trained and equipped that none but thoroughly reliable teachers will be sent into the country districts, and in all cases it is desirable that the teacher may be asked to do no more than the work of which he claims to be master. The travelling instructor must ever be disappointing unless the public itself be reasonable in its demands. This mild rebuke is not out of place, for, if the officers of this Branch are to do good work, some limitations must be set to their knowledge.

The average orchardist stands in sore need of instruction in—

(*a*) Soil preparation as by deepening, draining, cleaning, and sweetening.
(*b*) Manuring specific soils and crops.
(*c*) Seasons and conditions for irrigation.
(*d*) Cultivation, reasons, seasons, and methods according to soil, variety, age and condition of trees.
(*e*) Pruning according to variety, age, and local conditions.
(*f*) Selection of species and varieties for particular positions and markets.
(*g*) The preparation of fruits for market.
(*h*) The keeping down of pests.

If the travelling instructor can teach these subjects well, he will do well. To-day we have the painful illustration of every conceivable

kind of fruit being dumped down on 10-acre blocks, where as many degrees of latitude and widely dissimilar soils are necessary to their perfect development.

A very large number of orchards are placed on unsuitable areas where indifferent preparation leaves the sites badly drained, and insufficiently endowed with fruitful soil to build up and sustain healthy trees.

It would be presumptuous to attempt to put matters right where the conditions are radically wrong.

The State teacher may rightly be looked to to discover the advantages and the disadvantages under which respective growers are placed, and illustrate right methods, but he may not be blamed if he prove incapable of altering the character of climate or soil, or of endowing incompetent heads with brains or hands with industry. Fruit-growing cannot pay the indolent or the foolish, nor can any one help them.

The travelling teacher's is a thankless task, be he ever so skilful and industrious, but it is recognised that good work may be done in helping existing growers to obtain more from their land, and in spreading such knowledge as will lead to better selection of site and soil, preparation, and general management than has been displayed in the past.

IV.

With the object of laying the foundation of a right local system of orchard-making and management, it is proposed to establish a limited number of typical orchard blocks and demonstration grounds in country districts.

In these will be found examples of profitable species and varieties of fruits, systematic pruning, manuring, irrigating, soil management, the keeping down of pests, and other important aids to successful orchard work and preparation of fruits for market.

The work of planning and establishing the stations will be carried out by the Director of this Branch, who will make periodical visits to and give instruction in all centres, and arrange for all routine work to be carried out by the most skilful and industrious hands obtainable.

V.

The subjects dealt with in the Journal from month to month will comprise—

I. A special article on some seasonable and important subject.
II. A review of recent work.
III. A forecast of seasonable work in*—
  The orchard.
  The table and drying grape areas.
  The vegetable garden.
  The hardy flower garden.
IV. Work of the month by officers of the Division.
V. Original research work: Announcements, &c.

*The State will be divided into climatic zones, and every endeavour made to advise in accord with local conditions.

The Climatic Influences of Victoria as they Affect the Production of Commercial Fruits.

We may not speak of the hills or plains ; the north and south, and indicate a definite type of climate, for the geological formation, elevation, aspect, character and depth of soil, rainfall, ordinary sources of winds, and many other features go far to determine what is summed up in the word climate.

Plants dislike extremes of temperature, and having no powers of locomotion, they are forced to submit to all the contrasting conditions of the soil and the atmosphere of the different seasons. Knowing this, we should be careful to select a climate as uniform as possible for all plants of a permanent character, for it is quite exceptional for a plant to endure a hot dry summer and a cold wet winter with equal indifference.

The year of twelve months is by no means divided into four seasons of equal length. In one district the spring is long and the summer correspondingly short. In another the spring is scarcely apparent—summer heat succeeding rapidly upon the heels of winter. Winters vary, too. In cold and wet positions all movement on the part of trees comes to an end, and there is in some cases actual injury and loss of vitality, whilst in warm, mellow winter soils, food-stuffs are prepared and absorbed by the roots, so that they make considerable growth whilst the head of the tree is in a passive state.

The length of the growing period and the nature of the wood made varies in quite an extraordinary manner in different districts and in different years, and it is of course due to the differences in the seasons that stunted or heavy wood or much or little fruit occurs.

When we wonder why a tree or plant does not "do" we admit our ignorance of its nature and wants.

All the fruits of commercial value to Victoria have been in cultivation for many centuries, and their places of origin and the history of their development is in most instances well known, so that one need have no difficulty in acquainting himself with the instinctive habits and requirements of any species or variety. The peach, pear, apple, apricot, fig, table, wine, and raisin grape have all been actively cultivated for at least 4,000 years ; the cherry, lemon, plum, raspberry, gooseberry, and various currants, each about 2,000 years.

The most modern of our important fruits is the strawberry, which has been in cultivation barely 300 years. These periods of time are on the average so enormous, and the different races of men who have dealt with the fruits so numerous, that it is surprising that exact knowledge of their nature and requirements is not more common.

Heat, water, light, and air are in an ordinary sense the first causes of life as we know it in plants. Any excess or deficiency of either must prove injurious.

Plants thriving in hot dry regions are sensitive to cold and wet, and plants thriving in cold wet regions are sensitive to heat and

drought. There are some exceptions, or at least there are species of fruits which will stand the widest extremes which Victoria affords. The pear is an example, though it will not prove as profitable in the hottest or coldest as in the more temperate regions.

It is unwise for the small capitalist to make experiments, as he cannot send the riches of his experience to market, so before planting he should make a point of knowing what fruiting trees or plants will be *at home* under a given set of conditions.

All vitality and movement in trees being entirely dependent on the health and volume of the sap, it follows that this element should be carefully studied, that everything concerning its nature and by what means it is developed, what it provides, and the normal seasons of activity, and rest, may be thoroughly understood.

The sap is the sensitive and sustaining quantity in trees. It cannot endure over-heating or freezing with indifference. It is liable to ferment after reaching a certain temperature, and it then destroys all bark and wood with which it comes into contact. By the other extreme, frosts and floods and sour soils have the power to kill the sap in the roots and branches of certain species of trees.

Those whose sap ferments at the lowest temperature are apples and plums. Kinds most indifferent to floods, frosts, and sour soils are pears, quinces, and plums. The apricot is the most sensitive to wet and cold soil, and next to it come the peach and the lemon.

The leading twelve fruits for local culture may be grouped somewhat as follows :—

Apple,
Pear,
Plum,
Cherry.

These are similar in their wants as regards quantity, depth and temperature of soil, though the pear and plum will grow in much hotter positions than will the apple and cherry.

Lemon,
Grape,
Peach,
Apricot.

These will usually thrive under similar conditions, but the lemon and peach will flourish in a cooler position than the others.

Strawberry,
Raspberry,
Gooseberry,
Currants.

The strawberry and the raspberry will endure great heat and may therefore be much more widely grown than the gooseberry and currant, providing water and a good deep soil are available.

This is, after all, but a glance at the subject, for one might write for a month and still leave a great many important points untold. We are dealing with a part of nature, and her story is endless.

The present writer recognises the extreme difficulty (not to say the risk) of writing for the guidance of all Victoria. He cannot know the condition of every estate, or the capacities of its owner; but he ventures to say that the principles of fruit production and gardening are not generally understood and applied locally, and he trusts that, in issuing a few brief notes from month to month on the more important seasonable operations and the principles which govern them, some slight assistance may be given here and there, and no harm done to any one.

The Orchard.

The treatment of the soil during January must be in accord with the age, condition, and species of trees.

Irrigating and cultivating will greatly assist all young trees which have not yet reached bearing size, but where trees are full grown, strong, and more or less destitute of fruit or fruiting wood, no water should be given, nor should the soil be deeply stirred as a means to conserve moisture. Such treatment as will limit the feeding powers of the roots, slacken the sap flow and expose the main wood somewhat to the direct action of the sun will tend to the ripening of the sap, and the ultimate development of fruit-yielding wood. Water may be given to weakly trees, or such as are heavily laden with fruit, and show signs of lacking moisture. When irrigation is practised in summer, there is always the danger that buds will be started which would preferably be left dormant. Again, wood is promoted which has not time to ripen before the cold of autumn comes on. To be able to irrigate with certainty, we should know the time it takes to force buds, to make the requisite size wood, to ripen the wood, and develop the flower buds. The length of time varies with different species of fruit, and with the peculiarities of soils, climates, and particular seasons. Normally, plums, pears, cherries, and apricots take longer to develop a useful fruit spur or shoot than do apples and peaches. Hence the latter may be dealt with later in the season than the former. In ordinary years apricot wood may be promoted in January in the northern and north-western districts of Victoria, but November is often too late to start new growth south of the Divide. Apart from irrigation, a lot of shoots may exist in apples or pears which may appropriately be converted to spurs during this month. The warmer the district the later the work may be done. It will not be safe to make spurs by pinching back after the middle of January in the southern districts. Artificial spurs should not be of one size as regards substance and length, but vary according to their position in the tree, and the varying degree of vigour of the different branches. Example: A strong spur on the top of a limb, or springing direct from a stout limb would not yield flower buds, but push out one or more wood shoots, whilst a weakly shoot low down in the tree would, if pinched short, not attract sufficient sap to make it fruitful and valuable. The angle of growth and the degree of development in the leaves go far to determine the nature of the growth which will come

from any spur when it is artificially made by stopping a shoot in summer. Some leaves must always be left on the spur when it is made, or the sap will fail to run into it and nourish it. Twelve weeks may be set down as the shortest possible time in which fruiting wood may be made in our average summers, but some species, notably plums and pears, take twenty weeks or more when placed in cool deep soils.

The soil about citrus trees should never be allowed to get really dry. Only where the trees are large and over strong will a slight check be an advantage. The drainage must be perfect, so that plenty of water may be given at this season, and no sourness or stifling of the soil result. A strong late summer growth may be promoted now where there is no danger of frosts injuring the young leaves and wood. Oranges and lemons have the capacity to ripen leaves and bark in a very low temperature—anything actually above freezing point, but soft sappy wood will prove useless if it occurs in late autumn, so deal with trees now if they are short of leaves and wood for future use.

Young orchard trees must be generously fed and cared for this month, but no further thinning or stopping must be done. In fact, it is not usually advisable to interfere with the growth of young trees after November.

Table and Raisin Grapes.

The public like luscious fruits and not too sweet, during hot weather. Much water provides these advantages, but it also delays the ripening, prevents the fruit carrying to market, or keeping so well, and also promotes a coarse, rank, wood growth which fails to ripen, and prove of service at pruning time. Further, some of the worst maladies in the shape of oidium and anthracnose are promoted where thick, airless, and shady masses of foliage obscure the soil and the wood of the vine. Of course, there must be sufficient moisture in the soil to enable the roots to feed freely and continuously whilst the fruit is growing, but water should not be given in such a way as to close the soil or promote new leaves in excess of requirements.

Grapes to be suitable for drying must be large and very firm; hence a really good soil and its careful management are necessary. During January keep the ground clean and loose. If water is needed and available, run it in narrow furrows, plough these over as soon as it is possible to do so, and run a single harrow, if space permits, between the rows. Flooding is not to be thought of. It is a slovenly and dangerous practice, for it is rare indeed that land remains open and sweet after being entirely immersed, and if it is not so roots and leaves are soon affected to the extent that the existing and future crops are in jeopardy. A pan always forms about vines when they are flooded, and as this cannot be broken up by hand or horse implements owing to the spread of the foliage and fruit, a severely limited proportion of the surface gets aerated. All the surface must be clean and free, and all the soil within the root range moist, well nourished, and perfectly sweet, or fruit of high quality will not be obtained.

When grown south of the line of Echuca sultanas and currants usually make far too much wood and coarse foliage, so that the fruit is found only on the weak extremities of the vines, and it is not of high quality owing to its ripening when the bulk of the sap is still active and crude.

All strong growing vines when grown in a district favorable to wood growth require a proportionately shallow soil, in order that the root system may come under the influence of the summer sun, and the growth be moderate and well matured before the fall of the leaf. The highest degree of excellence in fruit for drying is obtained only where a fair proportion of the leaves ripen with the fruit.

Do not thin so severely as to promote other growth, as this will delay ripening, and lead to further crowding of leaves.

Consider what the vine and the crop needs. It may be more strength in the bearing-rods or those wanted for next season. If so, do not expose them to direct sunlight or they will harden and carry less instead of more sap. Observe the type of wood which yields the best fruit, and thin out such as is above and below the standard size. Wood springing from the lower, the broad, and the upper side of main rods will be of unequal size and value. When vines are young and strong shoots on the under side are usually the most fruitful. As the vine ages and the wood and bark harden, the upper side does not carry shoots or spurs too strong to bear fruit. The vine is a fascinating and most responsive plant to deal with. It will pay well to train and care for it for its own sake, and in so far as one knows its moods and needs and capacities, he obtains such an exact working knowledge as will enable him to meet the obstacles of all seasons and make a profit out of it year after year.

The Vegetable Garden.

On the low hot country north of the Divide, the chief concern is with growing crops, as frequent watering and cultivating are indispensable if peas, French beans, roots, and salads are to attain to full size and quality. Do not mould up potatoes where the soil is shallow or very hot and dry. It is only in deep, cool, and adhesive soils that the moulding proves favorable to the development of the tubers. If cabbages, leeks, celery, and other vegetables for autumn and winter use are ready for planting out, first dig the ground deeply, put in plenty of manure, give a thorough soaking, and give the beds a concave surface so that the water employed will be retained about the roots. It is useless during this month to plant out vegetables in a dry, poor, soil, and expect that an occasional drivel from a watering pot or chance shower will be of use. Naturally, the more manure and humus a soil holds, the less water it requires. It is also very much cooler and more favorable to free rooting. Artichokes, tomatoes, onions, sweet corn, marrows, pumpkins, sweet potatoes, creeping spinach, asparagus, capsicums, cucumbers, and egg plant will stand

ordinary summer heat, and do not call for a great deal of water. In fact, the majority of them will thrive under the ordinary rainfall if planted in spring or early summer, and subsequently hoed and kept clean.

The Hardy Flower Garden.

The garden in January should contain a wealth of strong and varied foilage rather than flowers, and lawns should be at their best, for it is during this period of the year that one looks to the garden to provide cool generous scenes, and a soft refreshing atmosphere after the heat of each day. A good lawn cannot be maintained at small cost, for it requires regular weeding, dressing, watering, mowing, and rolling. The grass on sharp corners, margins, and spaces overawed by shrubs or trees, is frequently allowed to die out and become bare and unsightly. There should be no occasion for these barren patches. If they will not carry grass, turn them to some other use. Throw the bare patch into the border, cut back or thin the offending tree or shrub, or give breadth and depth of soil to a corner that is too narrow, poor, and exposed. Repairs to buffalo lawns may be effected now, as this grass roots freely in the hottest of weather if the soil can be soaked before and after planting. Pay most attention to the exposed and the poor spots of the garden. Avoid odd and vacant corners, for these are the natural limits of the garden, and the eye looks to them to furnish a pleasing background. All soils should be thoroughly wetted before planting with annuals for late summer and autumn flowering. Nasturtiums, mignonette, sweet peas, marigolds, asters, and pansies may be sown now, and at almost every season in warm districts, for they mature early, and endure a considerable degree of both heat and cold. Cannas, dahlias, cosmos, zinnias, may still be planted out, and more cosmos sown towards the end of the month for planting in February. These, if pinched early, will make strong stocky plants, and yield a profusion of bloom well into the winter. Roses may be budded wherever the bark lifts readily from the wood. A corm or two of gladioli should be put in where there is a sign of a weak spot occurring. Cover all the soil of beds and borders with foliage and flowers. Mulch all shallow and dry spots, and where but little water obtains use it in the evening and through the night.

THE TOBACCO INDUSTRY.

REPORT FROM THE GOVERNMENT TOBACCO FARM, EDI.

By Temple A. J. Smith.

The season for tobacco culture promises to be a good one, transplanting being just completed, the young plants holding well, those first planted making satisfactory progress. The following varieties are being grown, viz.: Conqueror, Hester, Hyco, Comstock Spanish, Oronoko, Connecticut Seed-leaf, Sumatra, Kentucky Broad, and some varieties of local seed. Blue-mould made its appearance in the first week of November, doing most damage in the Moyhu district. Immediately upon its appearance at the Government Farm, the plants were sprayed with Bordeaux mixture, and the spread of the disease stopped. Experiments have been carried on in conjunction with Mr. D. McAlpine, in connexion with this disease, the soil of the seed-beds being treated with a solution of sulphate of copper before sowing, and it is satisfactory to note that these beds have not been attacked, though sown on similar soil and aspect, and the same conditions. Several parcels of leaf were sold recently at satisfactory prices, strips treated at the Government tobacco stemmery bringing from 6d. per lb. to 8d. One parcel of five tons of 1900 and 1901 seasons' crop selling at 6d. with the stem in. This crop was grown on the King River, and consisted chiefly of Hyco, Hester, and Conqueror varieties, and was the produce of 14 acres. Further inquiries are being made for several lots of tobacco, and the prospect of a local market for good Victorian leaf is better than it has been for some years.

That a good leaf can be grown has been proved by a few of the most careful and progressive growers, and with proper care and attention to curing and grading, and the choosing of the best varieties of seed, there is a good future before the tobacco industry in Victoria.

Under the new Tariff the producer is in a better position than ever previously; the extra duty of 6d. on imported leaf, together with the reduction of the proposed 3s. 6d. on manufactured to 3s. 3d., reduces the margin of profit to the local manufacturer, causing him to look for cheaper material to work upon, and that material should be the home-grown article on which the import duty would be saved.

CHIEF INSPECTOR OF STOCK'S BRANCH.

LIVE STOCK NOTES.

By J. R. Weir.

Fortunately the pastoral industries in this State are conducted with conspicuous success under the most favorable natural conditions, and were we only sufficiently favoured to be able to obstruct the introduction of other diseases and pests over and above those already permitted to find location here, Victoria will continue to be what it was when our intrepid explorers originally found it—a paradise for the lower animals. It is to be deplored that full recognition was not given to the importance of maintaining complete inspection and establishing a system of quarantine in the early establishment of this State through which a number of diseases both in the animal and vegetable kingdom might have been successfully excluded. As it is we find our graziers and farmers subjected occasionally to severe losses, but which are modified largely by the aid afforded through our Stock Department and its beneficent regulations. It behoves all those interested in stock to maintain a watchful care over their health, and more especially is it necessary to exert the utmost vigilance in preventing the admission of outside diseases, the ravages through which are so well known to all.

We all freely admit our wealth is chiefly derived from the soil, and we are indebted to the pastoral industries for the valuable export trade established in wool, butter, meat, hides, tallow, bacon, eggs, &c. The maintenance and increase of this trade is of paramount importance to every one in the State, and hence I claim that it is a matter of public duty for each and all practically to assume the rôle of honorary inspectors of stock.

If stock-owners are careless and fail to realize the duty devolving on them, not only in their own interests, but those of the State, to report outbreaks of disease, then it becomes the function of every well-wisher and citizen of the State to notify the proper authorities, either directly to my branch, or through the nearest police station. The proverbial stitch in time to rescue nine is in no instance more graphically illustrated in value than in the arousing of available authority to promptly suppress outbreaks of disease amongst our live stock. An isolated case of a beast left to die on the roads may seem to an ordinary observer an every-day circumstance, but this animal may prove the infective centre from which serious loss may result. It is possible that thousands of healthy stock may have to suffer through this criminal carelessness. A beast suffering from pleuro-pneumonia may be allowed to stroll up to a herd of dairy cattle in full profit,

with the inevitable consequence of the herd becoming infected, and the attendant cost of inoculation and quarantine. The income-earning medium is thus abruptly terminated, and possibly the loss of the best cows. This invariably happens when an outbreak appears. On the other hand, if prompt action be taken, the trouble reported, the disease recognised and remedial measures applied such as are always made available by this Department, then the loss is reduced to one or two animals, and the menace to surrounding herds destroyed. The initial cost is the best and wisest. The first affected animal has to be utilized to provide lymph or virus to protect the herd through inoculation, and should this be in good order and free from other invasions, such as tuberculosis, then the disease of pleuro-pneumonia is checked.

The question of inoculation to control the spread of this disease, I am aware, has been discussed in other parts of the world, where doubts still exist as to its effectiveness; but in Australia, where the operation has been properly conducted, it has been proved to be almost an infallible preventive. Necessary suitable care has to be exercised. The tails in odd cases will thicken, and possibly exhibit a want of precaution on behalf of the operator. When, however, this does take place amputation at the joint well above the inflamed region will obviate further trouble.

Pleuro-pneumonia has been unusually prevalent during the past two years, more so than we have experienced for several years previous.

I am glad to state that tuberculosis is on the wane, through the application of rigid inspection and the destruction of affected animals. This improved condition is also due partially to the intelligent interest exercised in the disease by stock-owners. They are recognising the necessity of being sufficiently acquainted with the symptoms to avoid the expense of either buying an affected animal or keeping it, for two salient reasons—first, the possibility of the animal acting as a contagious medium to the herd, and second, the danger of one of our inspectors detecting the trouble and ordering the destruction of the beast.

We are constantly faced with heavy losses in stock through diseases created by want of proper nutrition.

Absence of suitable and nutritious food is a source of considerable anxiety, especially to the dairy farmer, who relies on a herd in full profit for returns, particularly on country deficient in phosphates. In such a district as that I have resided in for years past, viz., Dandenong, where dairying is carried on very successfully, the land is most unsuitable, the nourishing elements for rich grasses are notoriously absent, and if the cattle were permitted to subsist solely on the natural grasses there, it would result in the appearance of such complaints as cripples (*osteo-malaciæ*), impaction of the omasum or bible, &c., and death; but this is fully realized by the dairymen, and they stall-feed largely to overcome these conditions, with the outcome that dairying is conducted on paying lines.

Of other diseases throughout the State, it is a pleasant duty to report that there is a marked absence. Sheep have been exceptionally healthy. One report recently reached me of an outbreak of scab, but on being investigated by an old and respected officer of this Department, in whom we have the utmost confidence (Mr. W. H. Stephen), the report was found to be groundless.

Recently the presence of Fowl Tick (*Argas Americanus*) was discovered in Melbourne. Prompt measures were adopted, not only to deal with the trouble locally, but also to prevent further invasions. Credit is due to Mr. Hart, the inspector at the Government cool stores, for the smart way in which the pest was detected, and the measures taken to prevent the mischief spreading. The Honorable the Minister of Agriculture has taken the requisite authority to apply such means as will effectually eradicate the source of trouble and relieve poultry owners. To allow the pest to go unchecked would strike a blow at one of our most promising industries, viz., the poultry and egg export trade.

A REMARKABLE CASE OF FECUNDITY.

The question of transmitting influence in the laws of breeding is so far ill-defined and imperfectly understood, yet evidences of hereditary tendencies occur in every-day life on the station or farm, and assist us to realize that these are controlled by fixed laws. Frequently the observations and conclusions arrived at by stock-owners are rendered doubtful by a set of circumstances which will not fit in with the general principle. It is often held, for instance, that when a cow gives birth to twins, either one or both are so deficient in vital power as to be of little value for breeding purposes, or even for the dairy. A case recently was brought into prominence in the Western District which controverts this suggestion. Mr. J. W. Anderson, of Tower Hill Park, owns a thoroughbred Ayrshire cow, "Rosette," bred by Mr. Geo. Rolfe. On the 16th April, 1898, she gave birth to twins (male and female). The female had her first calf in August, 1900, and the bull was placed at one of Mr. Anderson's dairy farms, to serve a herd this season, and twelve of the cows had twins. There is no history of special fecundity in Rosette's family, and it will be very interesting to watch the career of those twin calves in future.

REGISTRATION OF REMOUNTS FOR THE IMPERIAL GOVERNMENT.

By W. T. Kendall, M.R.C.V.S.

The question of registering horses suitable for cavalry and mounted infantry for the Imperial Government in this and other Australian States is one which demands thoughtful consideration.

The annual retaining fee paid for the registration of a horse in the United Kingdom is 10s., and it being improbable, as stated in the circular issued by the Agricultural Department of Victoria, that a scheme based on a higher annual grant would be entertained, it is doubtful whether Australian breeders would, under existing circumstances, favour the idea.

The retaining fee of 10s. per horse gives the Government the power for the year to purchase, on emergency, the horse so registered, at a price agreed upon prior to registration.

The class of horses required being from 15 to 16 hands for cavalry, and from 14.2 to 15.2 for mounted infantry; age, from five to ten years.

At the present time the demand is so great, and competition so keen, that it would be a difficult matter to induce breeders to enter into any arrangement of the kind. On the other hand, as soon as the demand declines the retaining fee alone would be a sufficient temptation to many to accept such terms.

In Germany the system of registration seems to work well; but instead of paying a registration fee the Government provides the stallions, which stand at a low fee (about 5s.) per approved mare. The progeny of these mares and sires, if suitable, are taken over by the Government when three years old at a fair price, and removed to the depôts, where they are handled and trained for the army. In this way the remounts are largely supplied.

The conditions under which horses are bred and reared in Australia are so different from those of either England or Germany that it is probable that a combination of the methods adopted in these countries would be most applicable here. At all events, it would certainly be a wise policy on the part of any of our State Governments to procure a few good stallions, and place them in suitable districts to serve approved mares at a low fee, so as to cut out a lot of inferior animals which ought not to be allowed to breed. In this way the services of a good horse would be made available to any one possessing a good mare, and good prices would be assured for every suitable horse bred.

Large and small breeders would be alike benefited, and a decided improvement in the class of horses produced, whether for oversea or local requirements, would soon be evident. There can be no two opinions about the necessity of stopping the breeding of inferior animals, which flood the markets and reduce the price of good horses, and so dishearten breeders and destroy our reputation for good horses.

The fact of the State Governments taking the matter in hand would in no way interfere with the Imperial scheme of registration of suitable army remounts, and fixing the price before registration.

In order not to compete with the owner of a good stallion, such horse should be purchased, leased, or subsidized by Government, and allowed to stand in the district, if required. A fair subsidy to the owner would be the difference between his ordinary fee and that charged by the Government for a stipulated number of approved mares.

For example, take the ordinary fee of a suitable thoroughbred sire to be £3 3s., and his average number of mares for the season 80, the total income from his services would be £252. If the Government selected this horse and arranged service fees at £1 1s. per mare the income would only be £84. The difference between £84 and £252, viz., £168, would represent the amount of subsidy to be paid by the Government. This arrangement should suit the owner of the horse admirably, for he would have no trouble in collecting his fees, as the £1 1s. would have to be paid at the time of service and the other he would receive in a lump sum.

Assuming that 60 out of the 80 mares proved in foal, each one would cost the Government £2 14s. 8d. This at first seems a large sum, but the expenditure would be justified by the rapid improvement that would take place in the breed and value of horses.

The best mares would be sought after and retained, instead of being allowed to leave the country or wear themselves out in towns, and it would be found unprofitable to breed from inferior ones.

It would be necessary to appoint a board of experts to select and place the stallions, and inspect and register approved mares. This would mean an additional expense, but which would readily be covered by charging a registration fee of five shillings for every approved mare, and owners of mares could scarcely object to this when they are getting a reduction of £2 2s. in the service fee. The mares could be paraded for inspection at fixed times and places, and it would also be necessary to brand and register the foals if the Government claims the first right of purchase.

Local committees would also be necessary, to see that none but approved mares were served by selected entires.

The scheme here suggested could be tried in a small way, in the first instance, in conjunction with some of the agricultural societies, and, if found to work well, could be extended. There is no need to incur a great outlay at the commencement, as there are good horses for the purpose already in the country, and no vested interests of any moment would be interfered with.

The initiation of a scheme of this kind by any of the State Governments would in all probability hasten the adoption of other suggestions for improving the breed of horses generally, such as the registration and licensing of all stallions advertised for public service, &c.

In Australia it is more necessary to improve the quality of horses than to breed larger numbers. The hitherto irregular demand and *fluctuating prices have led to the multiplication of a large number of* useless weeds. Such a state of affairs is very undesirable, and every effort should be made to improve the general standard of excellence and prevent the reproduction of unmarketable horses.

No country in the world is better adapted for breeding sound vigorous horses, and no country ever had a fairer start. None but the best were imported to breed from, and there were no wild or inferior indigenous races to contaminate them. It is only through gross carelessness and neglect that any deterioration has occurred. Plenty of good horses of both sexes still remain to breed from, if only judicious selection and mating are observed.

The certainty of a regular demand would, without doubt, induce breeders to put forth their best efforts, and in a short while we should be able to compete with any country in the markets of the world.

THE ENTOMOLOGICAL AND ORNITHOLOGICAL BRANCH.

ECONOMIC ENTOMOLOGY AND ORNITHOLOGY; SOME OF THE ADVANTAGES TO BE DERIVED FROM THEIR STUDY.

By C. French, Government Entomologist.

This subject is one which, in the present state of affairs in Victoria, appears to me appropriate, inasmuch as we have embarked in the cultivation of our rural industries to such an extent as to lead us to hope that the dismal prognostications of our pessimistic friends may not be realized.

When we look around us and see the large areas of land which have been taken up for farms, vineyards, and orchards, it will at once strike the thinking portion of us, at least, that we have as yet but touched the fringe of our great natural resources, and to tremblingly talk of a permanent overproduction in a first class article in either grain, wine, fruit, or other marketable commodities is but to expose our weaknesses, and shows that some of us at least are not thoroughly conversant with the facts of so important a subject.

My mission is, I understand, to help you to "fight" your insect pests, also to offer you a few words of advice on matters of interest to those who have taken up farming, orchard work, or gardening, either for a living or as a hobby. In doing this I have thought it better to point out to you a few matters which may be of importance, especially to young persons about to commence life as farmers, gardeners, orchardists, or vignerons; also to more advanced growers who may desire to know more about the insect pests by which they are surrounded, than they do at present. In the early days of fruit-growing in Victoria, I allude to the early fifties, when my late respected friends, T. C. Cole, R. Watmaugh, and a few others, led the way, we had but little to contend against in the way of pests, although the American blight, codlin moth, cherry borer, and a few others, were then amongst us, and I am able to state, from personal knowledge, that growers in those early days of fruit-growing in Victoria, by means of a little unanimity amongst themselves, were able to do a good deal towards fighting the insect pests of those times. As years rolled on, however, the so-called sportsmen made their appearance, and it is to these gentry who then shot, and who still continue to shoot down our valuable insectivorous birds, that the fruit-growers of Victoria and elsewhere are partially indebted for the large increase in insect pests all and sundry. Again, owing to the extensive importation, without check or hindrance, of trees and plants from other countries, our stock of

noxious insects has been largely augmented, and now we find ourselves face to face with hordes of the destructive insects of other countries, which by a little foresight and exercise of judgment might have been kept out altogether. We can fight opposition, but persistent indifference is a bad enemy to cope with, and is only to be dealt with by "special" treatment. The planting of orchards in our thickly-timbered districts has no doubt largely augmented the number of native pests, as many of those which I have described in Part I., II., and III. of my book have left their natural food only to attack that of our imported trees, the latter being, I suspect, more palatable to them than are many of our native gums, wattles, &c., &c. The destruction of our valued friends, the insect-eating birds, has, without a doubt, been the cause of an enormous increase in our insect pests, and nothing could have been more suicidal on our part than to have quietly permitted this destruction to continue as it has done.

On the subject of the supreme indifference which has led to such wholesale slaughter of our best birds, I have but little to say. But if I were to express my true feelings on the matter, I fear it would be much more impressive and inelegant than edifying. I feel, however, to put it mildly, that a great deal of the destruction of both insect and bird life has arisen partly from a want of knowledge of a subject so interesting and at the same time of such vast importance to the growers of this or any other country. This is where I consider that a practical acquaintance, however humble, with the insects and birds of one's district is absolutely indispensable to those engaged in our great rural industries.

Within the present century, one of the principal causes of the little attention paid to entomology in England and elsewhere has been the ridicule and almost, we may say, contempt which has been lavished, by the ignorant and unthinking, upon those who ventured to preach any of the advantages to be gained by a study of such matters. In a comparatively few years, however, things in this respect have vastly changed, and we have but to look at America with its splendidly-equipped entomological and ornithological institutions, and as their systems are being rapidly followed in Europe, and to a certain extent in these States also, we may reasonably expect to reap the advantages to be gained by such a study. We certainly ought to support those who have thus led the way in such eminently useful work, and in this connexion I here desire to place on record my appreciation of the persistent efforts of the agricultural and horticultural press of this and the sister States in their endeavours to draw the attention of growers and others to the absolute necessity of doing all that lies in their power not only to prevent the introduction of new pests, but to stamp out those which are already here.

Great naval and military commanders tell us how that to become fully acquainted with the habits or movements of an enemy is to assist them materially in their annihilation of the latter. So it is with ourselves in connexion with a knowledge of insect life in all its interesting

though ofttimes destructive bearings. We must be able in part to follow the practice of the physician or surgeon, viz.: to diagnose where such be required, and having found out the true cause and seat of the disease, then proceed to apply if possible the remedy.

We will suppose, for example, that a new beginner (and it is principally for such that this little discourse has been prepared) who, on becoming tired of the ephemeral pleasures of city life, wishes to go on the land and commence an independent business of his own, say as an orchardist. He will, if he has good sense, first consult some recognised authority as to the best situation for commencing operations. He will naturally desire as much reliable (take care that it is reliable) information as possible, consulting those who have had long experience, and above all those who have been successful themselves.

Having so far made up his mind he will naturally wish to know more about that which he is about to undertake. He will obtain reliable books, attend practical lectures bearing on the subject in which he has ventured. He will also prepare himself for his newly-imposed task by seeking for information from all available sources. His evenings, when not otherwise taken up, should be spent in the study of such subjects as chemistry of soils, manures, seasons, rotation of crops, markets, plant diseases of all kinds, &c., &c. Lastly, and not least, he should, if possible, provide himself with a good lens, supposing he cannot yet afford a microscope, although the latter may now be had at a very cheap rate. But some of our friends will perhaps say, "Oh, this advice may be all very well in its way, but what time will a man have left after spending his day in the field or orchard, or what inclination will he have, being tired, for either literary work or for the study of economic entomology?" My reply is that to the man who is intellectually or studiously inclined, few things are impossible. In this Journal will be brought together some of the most beautiful illustrations of destructive insects, birds, and their life-histories, that have ever been done in Australia. They were prepared under my direction by my friend Mr. C. C. Brittlebank, in after hours, often after his having followed the plough from daylight to dark—no light matter on such land as that on the Pentland Hills, I can assure you.

If you require further information on the subject of "how to do it," read Smiles' *Life of a Scotch Naturalist*, or *Lives of the Earlier Lancashire Botanists*. These works ought to be in the possession of everyone who, in the altered state of fruit-growing, and in these days of keen competition, must be up and doing. You will see, therefore, that without wishing to deprive you of your share of athletic and other pleasures, you can spend your spare time profitably both for yourselves and probably for others also. I do not, of course mean that our embryo orchardist should by the study of the subjects previously mentioned neglect for a moment his necessary duties. I well recollect my early horticultural training, when, in the winter, we used after the day's work was finished, and around the fire at night, to do much of our grafting, label-making, writing, preparing cuttings, &c., with our

instructor at our side, and on such occasions he would read to us from the works of Hogg, Loudon, Paxton, Kirby, and Spence, and others of the grand old books; and these books, from the various instructions therein given, have been the key to the success of some of the cleverest gardeners and horticulturists the world has ever produced, and thus many an instructive evening was in endless pleasure (I allude to pleasure with profit) passed by those learning the profession when such a thing as keen competition, bonuses, and eight hours labour were practically unknown.

Our young man may now be supposed—with the aid of a few pounds in cash, a fair stock of common sense, diligence, and a set of modern garden appliances, including good spraying apparatus, &c.—to have made a fair start. His trees have been well selected from advice supplied by qualified experts. The chemist, we will suppose, has been asked to furnish some particulars as to the soil and its constituent parts, and the work may be fairly said to have commenced. The trees appear to be thriving well, when lo! our friend detects something wrong, and his trees, which are either looking sickly or display signs, which to the practised eye are not to be mistaken, of some pest more or less insidious in its attacks upon the tree. What is best to be done? And the grower, being in somewhat of a dilemma, determines to seek advice, either from his books or from those whom a paternal Government has appointed for such work. He sends down specimens, obtains the necessary information, and all appears to be going smoothly. It is here where a practical knowledge of these matters makes itself apparent. He discovers, for example, that his peach trees are covered with little brown insects with long antennæ (or horns), and with two projections from the extreme end of the body. Now, the person who does not know, or has not read, anything about the nature and habits of this pest, often says to himself—"Ah, I have heard somewhere of Paris Green, I will give my trees a good dose, and so surprise our little brown friends." He gets the Paris Green, Hellebore, or London Purple, as the case may be, and with it he sprays his trees. The result is that he finds the aphids there as usual, and not in the least disconcerted by what he considers to be his remarkably ingenious device for their destruction. You will probably wish to know why and how this is. I will endeavour to tell you. The aphids, as well as the very large family of so-called "plant bugs" are wholly suctorial in their habits, that is, they have a rostrum or beak with which they pierce the bark of the tree, and by this means the sap is extracted or sucked out. It will thus be seen that such useful preparations as the arsenical compounds, Paris Green, London Purple, &c., are of little or no avail against such pests, as their proboscides or beaks are then far out of reach of such applications. The man who has studied the habits of these insects for himself knows this much, and proceeds to destroy the hordes of little insects by spraying with a liquid that will kill by coming into contact with them. (I need hardly tell you what to use, as this has been already explained in both Parts I., II., and III. of my hand-books, of which you doubtless

have copies.) You will thus see, by making a study of the subject, you can save a deal of useless experiment, and devote the time which such entails in work of a more profitable nature.

We will suppose the aphids on the branches to have been disposed of, no easy matter, as you probably know, when lo! next morning we find countless numbers swarming up the stems of the trees. It is then the man who neither reads or observes for himself would doubtless say—"Why, those that I sprayed yesterday have recovered, and are as lively as ever." But the careful grower will examine with his lens the parts of the trees sprayed with the proper material, and will thus satisfy himself as to the efficacy or otherwise of his attempts to destroy them, and if successful, he would look over the tree for further indications of their presence. The trained man knows that the insects are also upon the roots, where they hybernate, as well as on the rest of the tree. He at once comes to the conclusion that he must first strike at the "root" of the disease. Whereas the man who knows nothing of the subject, and probably cares but little either, proceeds to lament, and not infrequently winds up by chopping out his trees, and returning to the city with the melancholy wail that any attempt to grow fruit in Victoria must end in failure.

When one goes on the land, whether it is for the purpose of growing anything, from wool to special products, he will find that there are many leisure moments which may be profitably spent in the interesting and useful study of economic entomology and ornithology, and laying aside the marvellous provisions with which nature has provided many even of the simplest insects with the means of maintenance, the study is both useful, intellectual, and delightful. We will suppose that a grower comes upon an insect eating the epidermis or covering of the leaves from his fruit trees, and thereby admitting the direct rays of the sun at a time when such may not be desirable. If he has a well-trained eye, and even a slight knowledge of the subject, he will naturally think to himself, well, I will poison the leaves, and when the insects eat the tissues they will be destroyed. He gets out his sprayer, gives the tree a liberal spraying with one of the arsenites or other compounds recommended as before mentioned, and in a few hours he finds his caterpillars dead under the tree. His knowledge that the leaves had been attacked by insects which were *not* suctorial had therefore been of some practical use to him.

As an example (one of a great many which might be given) of "how not to do it," we will take the case of a grower. I have seen many such who whilst either digging, ploughing, or planting, kept a gun near at hand. Ask him why he carries a gun, he will probably reply, "to shoot the magpies destroying his crop." It has probably never struck him that our common bush magpies (both kinds), although they will occasionally eat grain, grapes, &c., are amongst the most valuable of our native birds. They follow the plough and spadesmen, picking up such grubs as may be turned up from the soil, and are the faithful friends and companions of the ploughman. Our old friend, the laughing

jackass, also comes in for his share of abuse and persecution from the ignorant and unthinking. I have seen many of these birds shot just because they happened to be perched on some high tree in or near the orchard.

Again, that beautiful, harmless, and strictly typical Australian bird, *Menura Victoriæ*, the well-known lyre-bird of our gullies, has, in the most systematic manner, been hunted down and killed, so that the few remaining ones have been driven back into the deep recesses of our mountain gullies. Surely this must be something more than ignorance on the part of those who by practice and observation ought to know better. Still, many of these "pot-shotters" might, if the nature and economy of this useful bird were properly explained to them, be induced to see the error of their ways. Many of you will, no doubt, recollect the serious outbreak of phylloxera that years ago occurred in the Geelong vineyards, and for which we were then totally unprepared. Owing, however, to the prompt action of the Government of the day, it was quickly—and, let us hope, permanently—eradicated in at least that district. Now, unfortunately, we have to face a somewhat similar visitation at Bendigo and other places, not very widely spread, let us hope; and, as one of our greatest industries, that of wine and grape growing in all its branches, is threatened, it behoves all of us to unite and make common cause against this dreaded insect scourge of this or any other country. When the phylloxera comes along, it comes to stay, as our American friends put it; and thus measures, however stringent they may be, should be adopted to check it. We know now at least something of the aerial as well as the root forms of this wonderful little insect, and this knowledge has enabled those living in the great wine-producing districts of Europe and elsewhere to bring into use the various means that have been tried for its eradication; and, as these remarks are condensed and published in Part II. of my book, every vigneron should read the descriptions, so that many senseless scares about the re-appearance of phylloxera might be avoided.

When the great scourge of locusts took place in Africa—and later on in America, Cyprus, and later on even in some of our own States—little was known of their life-history, although the plague is of such ancient origin. Nowadays, however, the inhabitants of these countries have been able, by a patient and exhaustive study of these insects, in many instances to have been partially successful in coping with what appeared to be a singularly hopeless task. It was found that there were two special periods at which the locusts could be successfully attacked. First, when in the egg stage, and secondly, in the newly hatched or "hopping" stage. The former is accomplished by collecting the eggs, the authorities paying the collectors a certain sum per bushel for the same. The second plan consists in driving the young locusts, which were found travelling always in the one direction, into screens and pits prepared for the purpose. When the young locusts are hatched, they travel for a few days in a circle, and, after having gained sufficient strength, they commence their onward march in the one

direction. During their march they eat up every living plant that they can manage to digest. They have a marvellous appetite, and when in the winged state will devastate the whole face of a country in no time. The screens often extend for hundreds of miles, over rivers and high mountains; and where labour is of little value, monetarily speaking, the number of locusts destroyed by means of these screens is simply beyond all attempts at calculation. In Australia, however, I am afraid that until the interior becomes more settled, and partly owing to the comparatively high price of labour, an attack on such magnitude as those which have taken place in the countries mentioned will be well nigh impossible. At present we in Victoria know a good deal concerning the life history of these pests; and partly for the purpose of refuting a statement that our Department of Agriculture was, on a certain occasion, too late in taking action, I obtained freshly-deposited eggs of the locust, and had them hatched artificially. After making allowances for the differences in temperature, &c., I found that we had a good two months between the hatching out of the young locusts and the time when they assumed the winged stage, and in which the insects could be attacked before taking flight. These experiments, which I undertook principally in defence of the Department, but partly for my own information, conclusively disproved the assertions that had been circulated that the Department had been dilatory in the matter. It also proved that it had done its best to induce the settlers to band together for the destruction of this common enemy.

In the early part of last year I received several large green caterpillars said to be doing great damage to the vines in many parts of the colony. In some instances they were described to me as "horrid things with a horn sticking out of their head"—the so-called "horn," I may say, is on the other end—and that when handled they would "spit and fly back." I was, of course, anxious to interview this "monster," when, to my astonishment, it proved to be the larva of the silver-striped hawk moth, an account of which you will find in Part II. of my hand-book. Now, if these good people had only taken the trouble to rear one of these grubs into the perfect insect, they would then have had a practical acquaintance with at least a part of the life-history and habits of one of the worst caterpillars of our vineyards.

How often has it happened that a traveller who by stress of weather, or from other causes, has been unable to accomplish the business for which he had left home, and has had to pass many a weary hour at some country hotel, and who has had the bitter experience—that is, if he be not an observer of nature—in making aimless walks, or perhaps sitting about doing nothing? Whereas, had he been a naturalist, his spare time could have been agreeably and profitably spent in observing and collecting some of the insects or plants of the district.

To those who know how to spend their leisure both profitably and intellectually at the same time, more especially in the delightful study

of nature and her handiwork, the feeling becomes one of intense pleasure. There is also the feeling that you are not only adding to your own stock of knowledge, but in all probability you are making observations that may be of use to some one else, and that some one will most likely be the grower.

We have thus said a little, only a little to be sure, concerning the use of entomology in enabling one to know something about the insects that are destructive to crops, and by which pests he may be surrounded. There is also another aspect of the question, and that is the advantage to be gained in being able to distinguish the difference between destructive and beneficial insects. Take for example the little ladybird, *Leis conformis*, which, when in the larval state, is so destructive to aphids all and sundry. It is no uncommon occurrence for me to receive from growers (I allude, of course, to those who have but little knowledge of the subject), these useful little creatures as something to be dreaded, and asking to be supplied with an effective remedy. Again, I have seen people shaking these, their best friends in the insect line, on to a cloth and destroying them wholesale. Surely this must be for want of knowing better; as a very cursory glance over any aphis-infested tree will disclose the presence of numerous ugly looking grub-like forms busily devouring aphids in a most voracious and wholesale manner. Then there are the Hemerobidæ, or lace-wings, which, when in the larval state, make great havoc amongst the aphids. "I must refer you to my books for fuller descriptions of these two 'insect helps of the fruit-grower.'" In France, we are told, boys are employed to prevent the birds, chiefly sparrows, from destroying these useful little ladybirds. The Syrphidæ are flies whose larvæ are armed with a singular mandible furnished like a trident with three points, with which they transfix their prey. These grubs are most destructive to aphids of all kinds. A large group of the Hymenoptera, wasp-like insects, are most merciless destroyers of many noxious ones, especially moths whilst in the larval and chrysalis stages. They do not, however, confine their attacks to members of the moth family, as even the destructive Cecidomyia, or Hessian Fly, has its enemies in certain minute species of a genus closely allied to the Ichneumons. In Europe no less than three species of these little flies are known to render valuable help in destroying the larvæ of this dread scourge of the wheat-grower. The economy of our formidable and much despised hornets, more especially those of the genus Sphex, Pompilius, and other large kinds, which we know by their orange-yellow bodies, mostly banded with black, and to some of us by their stings also, are well worth observing, as they destroy centipedes, grubs (when above ground), scorpions, cicadæ, &c., and in this murderous work they have but few equals. In helping us to fight our insect pests we have powerful auxiliaries in the predatory insects of many families, also in certain parasitic fungi, which have often been utilized with the best results. You will all recollect the discovery of the little ladybird Vedalia, which the United States Government so promptly used for the destruction of the Cottony

Cushion Scale, that arch enemy of the orange-growers of California and elsewhere, and which my friend Mr. Koebele and the late Frazer Crawford so persistently followed up to the great advantage of growers of the citrus family. I have introduced the Vedalia to Melbourne time after time, but owing to the voracious appetite of the accursed sparrow, which appear to relish these and but few other insects, my efforts so far have not been successful. In Victoria we have a number of beetles, especially among the Carabidæ which, both in the larval and perfect state, destroy vast quantities of the grubs attacking our cereal crops, grasslands, lawns, &c. I had one of these (Hyperion, our largest species) which had been sent to me by a friend at Mooroopna, to show how it would demolish either a grub or a moth. Unfortunately, however, an unfriendly rat got into the box, the lid of which I had incautiously left off, and in the morning nothing but a few fragments were left on which I could ponder as to the wrong principle of counting one's chickens before they are hatched.

Spiders also, at least a large majority of them, are very useful to growers, more especially as they are destructive to boring insects, also to those which hybernate under the bark of trees, native as well as those introduced, one of these animals, Voconia, often called Tarantula (which it is not), being a perfect glutton, as the piles of insect débris, *i.e.*, wing cases, &c., will show.

It would take hours for me to give even a brief account of the many advantages to be gained by a study of economic entomology and ornithology, as the subject is not only interesting and useful, but is well nigh endless. I will bring now this discourse to a close by remarking that to be successful we must be practical as well as energetic, always willing to learn from those who are willing to impart their knowledge to those seeking it, and never setting ourselves up as knowing everything, remembering that we may learn something from the humblest. Do not, when you have gained a little scientific knowledge, look with a superior sort of air upon the practical grower, as he, having better chances in the field than you have, may be able to teach you many a practical lesson. The time is upon us when we must use our heads as well as our hands, and the end of this will probably be, as the great Charles Darwin has told us, the survival of the fittest. I hope, by permission of the Victorian Department of Agriculture, to be able to publish at some future time, an illustrated work on the "Beneficial Insects of Victoria," as to growers this work would be nearly as important as those parts previously issued on the destructive kinds. I would like to mention, before closing, that my offices having been removed to a more central and commodious place, I will be very pleased to see any growers should they come to Melbourne. My rooms are in the new Crown Law Offices, Lonsdale-street, Melbourne, and in one of which is our museum of economic entomology and ornithology. To the former has lately been added a splendid collection of insects and their life-histories (fourteen large cases) from the South Kensington Museum,

London. The entomological library, which is very complete and valuable, is open to students of economic entomology, and I will gladly furnish any information required by those wishing for it.

I trust that the few remarks and hints which I have hurriedly given may be found useful as coming from one who has been a grower himself, and whose sympathies are identical with your own,

If after a few years time you can say that you have found the study of practical economic entomology and ornithology as useful and interesting as I have found it, my labours will not have been wholly in vain.

ON THE NECESSITY FOR THE PRESERVATION OF OUR INSECT-DESTROYING BIRDS, WITH AN ALPHABETICAL LIST OF THE PRINCIPAL KINDS.

By C. French, Government Entomologist.

To all who are engaged in either farming or fruit-growing, the preservation of our useful friends, the insect-destroying birds, is, in my opinion, of the very greatest importance.

Nature maintains a balance between the numbers of the birds, beasts, insects, plants, &c., in any district. If by artificial means we destroy this balance immediately intolerable numbers of some kinds remain with us, and we have to expend much money and labour to rid ourselves of the swarm which nature was ready to dispose of for us gratis.

Some writer has well said, as quoted by Mr. Tryon in his valuable book on the fungus and insect pests of Queensland—"If the arrangements of nature were left undisturbed, the result would be a wholesome equilibrium of destruction. The birds would kill so many insects that the insects could not kill too many plants. One class is a match for the other. A certain insect was found to lay 2,000 eggs, but a single tomtit was found to eat 200,000 eggs in a year. A swallow devours 543 insects in a day, eggs and all."

There is the whole case in a nutshell. The birds will do yeoman service, and ask for no wages.

The question will naturally be asked: How and by what means is the wholesale destruction of our insectivorous birds to be checked? This would seem to be a somewhat difficult question to answer, for have we not already game laws, but are they carried out? I am afraid not, and thus the good intentions of those by whom they were introduced have been frustrated.

To secure active co-operation in the direction of the preservation of insectivorous birds, we must be able by the aid of the stuffed specimens themselves to show those interested the difference between the noxious and the beneficial; to point out to those persons who are engaged in our great rural industries that their interest lies in uniting, as in the case of insect-pests, to maintain the balance which nature has given us, and more especially to endeavour to impress upon the young people the necessity for preserving certain birds from destruction.

Those unaccustomed to dissecting birds can have but a faint idea of the enormous quantity of insects many even of the smaller birds devour, and a better acquaintance with both birds and insects would, I am sure, tend to prevent such wholesale slaughter. The chief enemies of birds are the itinerant sportsmen and indiscriminate egg-hunters, who on holidays scour the country in all directions, until very little is left of

the bird-life of former days. In the case of such birds as parrots, leatherheads, sparrows, &c., which are destructive to either fruit or grain, those interested will, of course, know best how to deal with them.

But a very large number of our native birds feed solely on insects, and every such bird is always on the watch to protect the growers' crops. Let this fact be at once realized by the rural population, and there will be a chance of saving the birds. If once the birds become extinct here, it will be almost, perhaps quite, impossible to replace them.

In this Journal, the first number of which is now issued, it is intended to publish each month a coloured plate, with popular descriptions of the birds as per list herein given, as it is hoped that by this means the necessity for more active steps may be brought prominently before the public, also that the efforts of Messrs. Campbell, Hall, Keartland, and others of our State may be further emphasized.

The excellent charts in the schools ought to be the means of enabling persons to distinguish many kinds of birds and eggs which should be protected and preserved as being of essential service to all cultivators, and these illustrations could, with great advantage, be added to.

The importation of the insect-destroying birds of other countries would be advantageous, but in so doing great care must be used to make sure of the particular kinds we propose to introduce, so as to enable us to guard against a repetition of former and often most disastrous mistakes.

Before closing the above remarks I would like to point out the urgent necessity for a closer supervision of the shops and markets in which living birds are sold, also regarding permits which are from time to time issued to persons to shoot birds for special purposes, that before issuing any such permits the application should be submitted to a committee of ornithologists for their opinion as to the advisability or otherwise of issuing a permit to any one.

Appended is a list of those birds which have been proved by competent authorities to be destroyers of insects in our State, and I have to thank Messrs. A. J. Campbell, D. Le Souef, and A. Coles for their assistance in the compilation of the list.

The common names are those generally adopted, and which for convenience sake are placed before the scientific names.

ALPHABETICAL LIST OF THE PRINCIPAL INSECTIVOROUS BIRDS OF VICTORIA.

Common Name.	Scientific Name.
Acanthiza (Chestnut-rumped)	Acanthiza uropygialis.
Acanthiza (Little)	„ nana.
Acanthiza (Little Brown)	„ pusilla.
Acanthiza (Red-rumped)	„ pyrrhopygia.
Acanthiza (Striated)	„ lineata.
Bee-eater (Australian)	Merops ornatus.
Bristle Bird	Sphenura brachyptera.
Bristle Bird (Rufous-headed)	„ Broadbenti.
Bustard, or Wild Turkey	Choriotis Australis.
Calamanthus (Field)	Calamanthus campestris.
Calamanthus (Striated)	„ fuliginosus.
Campephaga (Jardine's)	Edoliisoma tenuirostre.
Campephaga (White-shouldered)	„ tricolor.
Cincloramphus (Black-breasted)	Cincloramphus cantillans.
Cincloramphus (Brown)	„ cruralis.
Cincloramphus (Rufous-tinted)	Ptenœdus rufescens.
Chthonicola (Little)	Chthonicola sagittata.
Coach-whip Bird	Psophodes crepitans.
Crow-shrike (Black-throated)	Cracticus robustus.
Crow-shrike (Collared)	„ torquatus.
Crow-shrike (Grey)	Strepera cuneicaudata.
Crow-shrike (Hill)	„ melanoptra.
Crow-shrike (Pied)	„ graculina.
Crow-shrike (Sooty)	„ fuliginosa.
Crow-shrike (White-backed)	Gymnorhina leuconota.
Cuckoo (Black-eared)	Mesocalius palliolatus.
Cuckoo (Bronze)	Chalcites plagosus.
Cuckoo (Brush)	Cuculus insperatus.
Cuckoo (Fan-tailed)	„ flabelliformis.
Cuckoo (Narrow-billed Bronze)	Chalcites basalis.
Cuckoo (Pallid or Unadorned)	Cuculus pallidus.
Diamond Bird (Allied Pardalote)	Pardalotus affinis
Diamond Bird (Spotted Pardalote)	Pardalotus punctatus.
Diamond Bird (Striated Pardalote)	„ ornatus.
Diamond Bird (Yellow-rumped Pardalote)	„ xanthopygialis.
Duck (Whistling-tree)	Dendrocygna vagans.
Doller Bird (Australian Roller)	Eurostomus Pacificus.
Ephthianura (Orange-fronted)	Ephthianura aurifrons.
Ephthianura (Tri-coloured)	„ tricolor.
Ephthianura (White-fronted)	„ albifrens.
Fantail (Black)	Sauloprocta motacilloides.
Fantail (Rufous-fronted)	Rhipidura rufifrons.
Fantail (White-shafted)	„ albiscapa.
Fly-catcher (Brown)	Micrœca fascinans.
Fly-catcher (Carinated)	Monarcha melanopsis.

Common Name.	Scientific Name.
Fly-catcher (Leaden-coloured) -	Miagra rubecula.
Fly-catcher (Restless) - - -	Seisura inquieta.
Fly-catcher (Shining) - - -	Miagra nitida
Geobasileus (Buff-rumped) -	Geobasileus reguloides.
Geobasileus (Yellow-rumped) -	" chrysorrhæa.
Gerygone (Brown) - - -	Gerygone fusca.
Grass-bird (Little) - - -	Sphenœacus gramineus.
Graculus (Black-faced) - - -	Grauculus melanops.
Graculus (Ground) - - -	Pteropodocys phasianella.
Graculus (Varied) - - -	Graculus mentalis.
Hylacola (Red-rumped) - -	Hylacola pyrrhopygia.
Ibis (Glossy) - - - -	Ibis falcinellus.
Ibis (Strawnecked) - - -	Geronticus spinicollis.
Ibis (White) - - - -	Threskiornis strictipennis.
Jackass (Great Brown Kingfisher or Laughing) - - - -	Dacelo gigas.
Kestrel (Nankeen) - - -	Tinnunculus cenchroides.
Kingfisher (Azure) - - -	Alcyone azurea.
Kingfisher (Red-backed) - -	Halcyon pyrrhopygius.
Kingfisher (Sacred) - - -	Halcyon sanctus.
Lark (Horsefield's Bush) - -	*Mirafra Horsfieldii.*
Lyre-Bird (Queen Victoria's) -	Menura Victoriæ.
Magpie (Piping Crow-shrike) -	Gymnorhina tibicen.
Magpie Lark (Pied Grallina) -	Grallina picata.
Martin (Fairy) - - - -	Lagenoplastes ariel.
Night-jar (Owlet) - - - -	Ægotheles Novæ-Hollandiæ.
Night-jar (White-throated) - -	Eurostopodus albogularis.
Night-jar (Spotted) - - -	" guttatus.
Oreoica (Crested) - - - -	Oreoica cristata.
Owl (Grass) - - - -	Strix candida.
Petrel (Blue) - - - -	Halobœna cerulea.
Pigeon (Top-knot) - - -	Lopholaimus antarcticus.
Pipit (Australian) - - - -	Anthus Australis.
Plover (Southern Stone) - -	Ædicnemus grallarius.
Podargus (Cuvier's) - - -	Podargus Cuivieri.
Podargus (Tawny-shouldered) -	" strigoides.
Pomatostomus (Chestnut-crowned) -	Pomatostomus ruficeps.
Pomatostomus (Temporal) - -	" temporalis.
Pomatostomus (White-eyebrowed) -	" superciliosus.
Pycnoptilus (Downy) - - -	Pycnoptilus floccosus.
Red Throat - - - - -	Pyrrholæmus brunneus.
Robin (Flame-breasted) - - -	*Petrœca phœnicea.*
Robin (Hooded or Pied) - -	Melanodryas bicolor.
Robin (Pink-breasted Wood) - -	Erythrodryas rhodinogaster.
Robin (Red-capped) - - -	Petrœca Goodenovii.
Robin (Rose-breasted Wood) - -	Erythrodryas rosea.
Robin (Scarlet-breasted) - -	Petrœca leggii.
Robin (Scrub) - - - -	Drymodes brunneopygia.
Robin (Yellow-breasted) - -	Eopsaltria Australis.
Sericornis (Allied) - - - -	Sericornis osculans.
Sericornis (Sombre-coloured) - -	" humilis.

Common Name.	Scientific Name.
Sericornis (Spotted) - - -	Sericornis maculatus.
Sericornis (White-fronted) - -	" frontalis.
Shrike (Spangled Dronga) - -	Chibia bracteata.
Shrike-Thrush (Harmonious) - -	Collyriocincla harmonica.
Shrike-Tit (Frontal) - - -	Falcunculus frontatus.
Sittella (Black-capped) - - -	Sittella pileata.
Sittella (Orange-winged) - -	" chrysoptera.
Smicrornis (Short billed) - -	Smicrornis brevirostris.
Swallow (Masked Wood) - -	Artamus personatus.
Swallow (Tree) - - - -	Hydrochelidon nigricans.
Swallow (Welcome) - - -	Hirundo frontalis.
Swallow (White-breasted) - -	Cheramœca leucosternon.
Swallow (White-eyebrowed Wood)	Artamus superciliosus.
Swallow (White-rumped Wood) -	" leucopygialis.
Swallow (Wood) - - - -	" sordidus.
Swift (Australian) - - - -	Cypselus pacificus.
Swift (Spine-tailed) - - -	Chætura candacuta.
Thickhead (Gilbert's) - - -	Pachycephala Gilberti.
Thickhead (Olivaceous) - - -	" olivacea.
Thickhead (Rufous-breasted) - -	" rufiventris.
Thickhead (White-throated) - -	" gutturalis.
Thrush (Chestnut-backed) - -	Cinclosoma castaneonotum.
Thrush (Cinnamon-coloured) - -	" cinnamomeum.
Thrush (Spotted-ground) - -	" punctatum.
Thrush (Mountain) - - -	Geocichla lunulata.
Tree-creeper (Brown) - - -	Climacteris scandens.
Tree-creeper (Red eyebrowed) - -	" erythrops.
Tree-creeper (White-throated) - -	" leucophæa.
Warbler (Black-backed Superb) -	Malurus melanotus.
Warbler (Lambert's Superb) - -	Malurus Lamberti.
Warbler (Long-tailed Superb) -	" Gouldii
Warbler (Reed) - - - -	Calamoherpe Australis.
Warbler (Rufous-headed Grass) -	Cisticola ruficeps.
Warbler (White-winged Superb) -	Malurus leucopterus.
Warbler (Blue-wren or Superb) -	" cyaneus.
Wedgebill (Crested) - - -	Sphenostoma cristata.
Wren (Emu) - - - -	Stipiturus malachurus.
Wren (Striated) - - - -	Amytis striatus.
Wren (Textile) - - - -	" textilis.
Xerophila (White-faced) - -	Xerophila leucopsis.

VEGETABLE PATHOLOGIST'S BRANCH.

"TAKE-ALL" IN WHEAT.

By D. McAlpine.

The disease in wheat known as "Take-all" has existed in Australia between forty and fifty years, and although the subject has been investigated at various times, and suggestions as to the cause and proper treatment put forward, the nature of it is still a matter of dispute.

A number of affected wheat-plants from different districts were forwarded to this Branch during the present season, and diseased patches were inspected in the Warracknabeal, Murtoa, and Horsham districts; the results of this examination, together with a general account of the disease, being given here.

Even farmers themselves recognise that a question like this, in which no satisfactory conclusion has been arrived at, after so many years' investigation, is not to be settled without full inquiry, and so the present report will be merely a preliminary to future work.

What is "Take-all"?

But before proceeding further we must settle what we mean by "Take-all," for the term is used by farmers very much as "Die-back" is used by fruit-growers, and may refer to very different diseases. There are a set of symptoms, however, to which the name of "Take-all" is applied in Australia, and these are generally as follows:—The wheat-plant makes a start all right, but before the stalk appears, the green colour fades, and the outer leaves become yellow. When the stalk is developed it soon becomes stunted, and never matures the ear. The entire plant soon dies, and this is the case over the affected area.

The roots, too, have a very characteristic appearance. They are stunted and deformed at an early stage, and may be quite thickened and knotty close to the stem. They are excessively covered with root-hairs, and new roots are generally thrown out just above the old ones. The occurrence of the disease in patches is another feature. It begins in small spots and gradually spreads, the wheat-plants dying off in patches, larger or smaller, according to the virulence of the attack. The expressive name of "Take-all" indicates that the plants are completely destroyed, and only in exceptional cases are healthy plants found on diseased spots.

It is not easy, however, to settle the exact limits of the disease, and several cases may be mentioned in which the effects are similar. Thus, grubs of various kinds may attack the roots of young wheat-plants,

and cause their decay. But although they may begin in different spots, and spread, yet they are usually general over the crop. The destruction of the roots in this case would be evident on examination.

Again, where trees have been burnt up on the ground, or on old sheep-yards, where nitrogenous manure has accumulated, the evil effects of the excess of manure or the drying up produced in such spots, may cause the plants to wither and die with the advent of the summer.

Similar symptoms may also be produced when the land is exhausted by a succession of similar crops, and has become wheat-sick, but this does not apply, of course, to virgin land, and weeds of various kinds are often associated with "Take-all," such as the "hunger-plant," or French catchfly (*Silene gallica*), but they simply indicate that the land is too poor or too dry to grow a wheat crop, and that a system of early fallowing and manuring should be undertaken.

Causes Assigned.

Various causes have been assigned for the recognised symptoms of "Take-all," but before giving our own observations it will be profitable to glance briefly at the views held by those who have given some attention to the subject. In 1870 the late Dr. Carl Muecke published a prize essay on the subject as regards South Australia, and after pointing out the great loss already sustained up to date, estimated at £6,000,000, he attempted to show the cause of the disease and the consequent remedy. He discovered on the roots of the affected wheat-plants a sort of mould, to which the late Baron von Mueller gave the name of *Xenodochus cerealium*, and by means of the spores of this fungus, the disease was supposed to be carried to other plants predisposed for its reception. This fungus belongs to the family of Rusts, which are all parasitic, but the late Baron did not consider this organism as a cause, but only as an accompaniment of the disease. The real cause of the disease Dr. Muecke considers to lie in a deficiency of certain substances in the soil, such as phosphoric acid and potash, in which case the evident remedy is to supply the needful constituents.

Even in virgin soil, where the true "Take-all" may sometimes occur, it is confined to limited spots, where certain essential ingredients are probably absent, and it is always first observed in light-coloured hungry patches.

He claimed to have proved by experiment the truth of his assertion, for when the above-mentioned ingredients were applied in solution to "Take-all" spots, when the plants were in the first stage of the disease, they recovered, while untreated plants died off.

Then, in 1887, Mr. Pearson[2] examined samples of wheat affected by so-called "Take-all," and while he found various fungi, which, unfortunately, were not definitely determined, he came to the conclusion that it was a poverty disease, and that the "fungus which causes 'Take-all'" attacks mainly such crops as are insufficiently

nourished. The analysis of the soil from diseased patches showed that it was poor in all respects, more especially in respect of nitrogen and phosphoric acid. In this case, however, the disease was not typical "Take-all," for the crop sown in May came up evenly, and looked well towards the end of October, when it was out in ear, and on affected patches the plants then began to wither and decay.

In 1892, Mr. J. G. O. Tepper, F.L.S.,[3] of South Australia, contributed an article to the *Garden and Field*, entitled "Take-all and its Remedies," and he likewise came to the conclusion that "Take-all" is nothing else than starvation of the crop, aggravated and intensified, it may be, by mould, insects, &c., and the evident remedy is to restore the fertility by the application of suitable manure.

Again, in the same year, Dr. Cobb[4] wrote a paper in the *Agricultural Gazette*, of New South Wales, on "Take-all and Dry Blight." After dismissing the various theories as to the cause, such as insects, weeds, nematode worms, and deficiency in the soil, he held that fungi were responsible, particularly mentioning the common *Cladosporium herbarum*, which he even ventured to name "Take-all," and *Septoria graminum*, or Dry Blight.

Such general measures are recommended as will insure healthy crops, viz.:—Rotation, good drainage, and careful cultivation.

There are thus two leading theories in the field at present to account for "Take-all"—the deficiency-in-the-soil theory and the fungus theory.

Own Observations.

Our own observations will now be given, but they are by no means final, and may be modified by the results of experiments to be carried out during the forthcoming season. They were based upon an exhaustive examination of an immense number of affected plants and an inspection of the conditions under which they were grown. Plants were examined over an area extending from Goornong in the central north, to Diapur in the extreme west.

Nematodes, or Thread-worms.

A very general accompaniment of the disease was the presence of Nematodes, or Thread-worms, at the roots. They were not, however, universally present, but might in certain cases be a contributing cause. In plants received both from South Australia and Victoria, which had died off in patches, they were present in larger or smaller numbers, and it was observed that old, shrivelled up dead plants showed fewer thread-worms than the more recently-decayed plants, or plants in a less advanced stage of the disease in the same ground.

Fungi.

As regards fungi, the only one requiring consideration at present is the Wheat stem-killer (*Ophiobolus herpotrichus*). In many instances, the basal portion of the stem was considerably blackened, and on the inner surface of the sheaths the minute fruits of the fungus were found

in great profusion. Last year (1900) this same fungus was determined for the first time for South Australia, and was the cause of serious losses to the wheat-growers there. The roots, too, were often black and dead, and covered with the black threads of a fungus which may have belonged to the same species.

In the "crab-holey" country, between Horsham and Murtoa, this fungus was comparatively common, and might be held accountable for the disease in some instances, but the mature fungus was by no means always present, though there was always found mycelium which may have belonged to this species.

As far as our knowledge extends at present, this species can hardly be regarded as a primary cause of the disease. The two fungi previously referred to as being considered responsible for "Take-all" by Dr. Cobb are very common indeed, but, since they occur frequently on fully-matured plants, and accompany a robust as well as a weak growth, cannot be regarded as the primary cause of "Take-all."[5]

In the examination of the diseased plants this season, *Septoria* was exceedingly common, but, curiously enough, not one single tuft of *Cladosporium herbarum* or any other Cladosporium was found.

Conditions under which "Take-all" Occurs.

The plants themselves can be submitted to careful observation, either by the naked eye or by the microscope, and any mature forms of life found upon them can be determined with certainty, and the probabilities weighed as to their being a cause or a consequence of the disease. But, when the conditions under which they are grown are taken into account, then a very wide field is opened up for investigation, and the soil and the climate, the heat and the moisture, the methods of cultivation, and the course of rotation have all to be considered.

The result of direct personal observations in the Warracknabeal district and towards Donald goes to show that wherever the soil is lightest the patches are worst; and those paddocks in which the soil is not so loose are little if at all affected. Light, loose, grey soils seemed to be particularly liable. Red, sandy loam seemed to be free from "Take-all," but there is difference of opinion as to this.

The variety of wheat does not seem to make any appreciable difference in the liability to attack, although Purple Straw and Dart's Imperial are generally considered to be the worst.

During a visit to Warracknabeal a paddock was inspected in which three varieties of wheat were sown on successive days side by side to the extent of from 20 to 30 acres. Dart's Imperial and Purple Straw were very badly affected, while Steinwedel, which oc upied the central strip, and to all appearance the same land, was very much less affected. As far as present observations go any variety may be affected. It may be pointed out here that there is no suspicion of the disease being in the seed, for the same seed may grow a healthy or an unhealtny crop, and even on diseased patches the seed germinates and produces a normal plant at first.

To put the matter as briefly as possible, I would say that "Take-all" largely depends on the nature of the season and the mechanical condition of the soil. If there is sufficient moisture in the winter to give the young plants a good start, and the spring rains succeed, to continue the growth thus favorably begun, then one of the contributing causes towards "Take-all" is removed. Again, if the soil is neither too dry and loose to form a firm seed-bed, nor so wet as to cake into a solid mass, and contains sufficient plant-food, particularly phosphoric acid and potash, to nourish the growing plants, then the "Take-all" will not appear.

The lack of moisture during the past winter prevented the necessary food-material for the growing plant being dissolved, and this is borne out by a report from the Wimmera in October that wheat sown in a dry seed-bed before the rain, was dying out, while the same wheat sown in a damp seed-bed was by far the best.

The looseness of the soil, combined with this deficiency of moisture, would prevent the roots acting properly, and the evident effort of the affected plants to increase their root surface for the absorption of food by an enormous multiplication of the root-hairs bears this out. Similar results would ensue if the soil in certain places was hard and water-tight, for then the young roots could not penetrate the soil and without the necessary moisture they would soon decay.

Farmers' Opinions.

A series of questions were sent to some of the leading farmers and replies received, but it was not possible to get full information in time for this preliminary report. Mr. Molineux, of the Agricultural Bureau, South Australia, has kindly undertaken to send a printed circular with queries concerning "Take-all" to 110 districts over the whole of that State, and it is to be hoped that Victorian farmers with experience of this disease will send replies to the questions printed as an appendix. As might be anticipated, there is a difference of opinion on several points, but there is general agreement that the disease is worst in a dry season; that a good rain in the spring checks it; that it is most prevalent on loose friable land; and that, as a rule, it does not occur on properly manured land. In the "crab-holey" country around Murtoa and Horsham the disease occurs exclusively on the banks and never in the depressions. The soil on the banks is much looser and soon becomes very dry unless there is a fairly rainy season. The position there has been summed up by several local farmers in the words—"When there is a fairly wet season we have no 'Take-all'; there is a crop then on the banks as well as in the depressions, but in the dry years the tops of the banks do not yield well, and our crops are patchy." One farmer in the Nhill district writes—"Some years it appears on loose banks, and others on land that sets hard." Another in the Glen Albyn district—"I think land that remains loose in the bottom is subject to the disease." And another in the Horsham

district—"This year it is prevalent in soils composed of sandy loam, generally on sloping ground." In the Minyip district—"'Take all' is always worse in loose soil, when worked dry."

As regards cultivation, there is a consensus of opinion among farmers that early fallow with plenty of rain escapes the "Take-all," but it occurred in many cases of late fallow. If a late fallow is followed by a dry season then the disease is severe, and many regard no fallow as better than a late fallow. It is the universal opinion of farmers that "Take-all" does not show in oats, but there is a difference of opinion as to whether the succeeding crop of wheat is affected or not. Oats are very hardy and gross feeders, and can stand greater vicissitudes of climate than the wheat. The roots also go deeper in search of food, and thus occupy a different layer of the soil.

Summary.

As far as our present observations go, the following represent the principal facts concerning "Take-all":—

It generally occurs on loose soil and in "crab-holey" land on the banks, and not in the depressions. When, however, the soil in such depressions sets hard, it may appear there, or indeed on any land which has "caked."

It does not attack oats, but it may reappear if wheat is sown on the same land afterwards.

The disease is worst in a dry season, and a good spring rain checks it.

Various insects and fungi may be found associated with affected plants, as well as nematodes, or thread-worms, and in some instances the fungus known in Germany as the "Wheat Stem-killer" may destroy the plants.

The most important factors, however, in the production of "Take-all" seem to be the lack of moisture during the winter, combined with a looseness of the soil, or conversely a hard, impervious soil, so that the young wheat plant is starved, although not necessarily from the absence of the requisite ingredients in the soil.

To counteract those influences which encourage "Take-all," attention should be paid primarily to the conservation of moisture, by early fallowing, when land is not too dry. In addition, drilling and manuring, feeding off with sheep, or, failing a sufficient growth, rolling in the spring, are also likely to prove beneficial, and experiments will be conducted in the coming season to ascertain the precise effect of these measures.

Literature referred to.

1. Muecke (Dr. Carl)—"The Take-all (*Xenodochus cerealium*)." Prize essay, published under the authority of the Board of Agriculture of Victoria, 1870. (Mason, Firth, and Co., Melbourne.)

2. Pearson (A. N.)—"Blight in Wheat." Bulletin No. 1, Department of Agriculture, Victoria, June, 1888.

3. Tepper (J. G. O.)—"Take-all and its Remedies." *Ag. Gaz., N.S.W.*, vol. III., January, 1892. (Reprinted from *Garden and Field.*)

4. Cobb (N. A.)—"Take-all and Dry Blight." *Ibid.* December, 1892.

5. McAlpine (D.)—"The Fungi on the Wheat-plant in Australia." *Ibid.* September, 1898.

Circular of Questions re "Take-all."

(1) What is the nature of your land? Heavy, firm, loose, light, friable, crab-holey?

(2) Was your land fallowed?

(3) How many years since first sown?

(4) Sown broadcast or drilled?

(5) Manured or not?

(6) If manured, with what? And how much per acre?

(7) What variety of wheat was sown?

(8) Was your crop rolled in the spring? or after sowing? or not at all?

(9) Was your crop fed off with sheep?

(10) If your land is crab-holey, is the disease worse on the banks or in the hollows?

(11) Is the disease worse on light, loose soils than on heavy land? or the reverse?

(12) Can you say whether the diseased patches are on looser or firmer soil than the remainder of the paddock?

(13) Is "Take-all" worse in wet or dry winters?

(14) What effect has a good spring rain on the disease?

(15) Have you any further information you can give?

Kindly give answers to questions, and return with name and address to D. McAlpine, Vegetable Pathologist, Department of Agriculture, Melbourne.

ROSE RUST.

(*Phragmidium subcorticium.*)

By D. McAlpine.

If allowed to spread, this disease may become a troublesome pest and do serious damage, as it has already done in Britain and on the Continent. It is known as rose rust, easily recognised by its bright orange colour, due to a fungus.

In several of our nurseries this disease has been rather severe during the present season, and I have even had specimens sent from South Australia. The moist season alternating with the hot weather has favoured its spread.

Like other fungus pests, its mode of attack has to be carefully studied in order the more effectually to checkmate it.

Its most important part, although one not visible to the naked eye, is the mycelium, or spawn, which is the vegetating portion of the fungus, and grows among and feeds upon the tissues of its host. When this nutriment has been used up within a given area, the fungus proceeds to multiply its kind, and this it does by means of minute coloured bodies produced at the surface and known as spores. No less than three different kinds of spores are produced in one season to enable it to accommodate itself in the most complete fashion to its surroundings.

In the spring roundish clusters appear on the leaves and young shoots, and are soon filled with an orange-yellow powder, which is just one mass of spores.

Then, in the summer, the patches deepen in colour owing to the formation of a second kind of spore known as the summer spore. These are produced in great abundance and readily reproduce the fungus, which spreads with alarming rapidity if the necessary heat and moisture are forthcoming. Then, as if to show that the resources of the fungus are not exhausted, towards the end of the season a fresh lot of spores appear, forming minute black dots on the under surface of the leaves. These are the winter spores, which are intended to tide the fungus over the dull season and reproduce it in the spring when the soft and succulent tissues of the rose afford the necessary nourishment. Thus the fungus is provided with three strings to its bow, as it were, which form a very efficient means of attack. It may be noted, in conclusion, that this rust confines itself to the rose both wild and cultivated, and has no connexion with any other form of vegetation.

The life-history thus briefly sketched will enable us to understand and appreciate the measures necessary for prevention.

1. All fallen leaves in the autumn should be collected and burnt, so as to destroy as far as possible the winter spores. It is from these winter spores that the fungus arises in the spring, and if they are

destroyed the disease will not appear. The agency of fire is a very useful one in dealing with all diseased portions, which only occur above ground.

2. Before the buds expand, and while the rose is still dormant, drench the plant as well as the soil with a weak solution of bluestone *or sulphate of copper, say at the rate of 1 lb. to 25 gallons of water.* This will destroy any spores lurking around the buds or on the ground, only awaiting the breath of spring to start into activity.

3. After the leaves have appeared, spray with a dilute solution of Bordeaux mixture, say at the rate of 1 lb. bluestone, 1 lb. fresh lime, and 8 gallons of water, in order to prevent any further development of the fungus in the young and tender tissues. The spray will not only tend to destroy the fungus, but to protect the plant against outside infection.

If these precautions are taken and intelligently carried out, the grower will have the satisfaction of having saved his rose bushes, and at the same time illustrating the maxim that "knowledge is power."

ANIMAL PARASITES.

A. A. Brown, M.B., B.S.

The chain of animal existence possesses many curious and interesting links. One of these is constituted by creatures which are incapable of perpetuating their existence without the active intervention and direct support of other beings in the links that build up the great chain. Each creature plays its own special part, and it has been ordained in an inscrutable way that these forms low down in the scale of existence shall become conspicuous actors in the great drama of life. Human intellect is stunned at the marvellous ways instinct guides these creatures through their wanderings in their various stages of development to achieve their salvation. As soon as born each knows the part it has to play, and the marvel is how it guides itself successfully through the intricate metamorphoses of its life. Nature, "a mother kind alike to all," has prepared beforehand the food that each living thing is to consume, and instinct again prompts each individual to seek out and devour what suits his requirements best. In the domain of nature it has been pre-ordained that "the stronger shall the weak devour," and the greater proportion of all creatures live on the booty of their own depredations. By the side of those that earn their own food by their independent efforts, there are other creatures that do not prey on their own account, but feed upon the booty gathered in by others. These dependent creatures that do not prey on their own account establish themselves as parasites in the organs of those that do earn their own living. These creatures then that are dependent for their entity on the nourishment supplied by the tissues of others are called parasites. Some require merely a resting place in their host, some require part of the booty of the chase, some consume only the detritus, some feed at the expense of their host, either establishing themselves in his organs or by making periodical marauding excursions to his body. A great number of creatures that are really dependent for their subsistence on the exertions of others are not true parasites. Nature has ordained that many animals shall live in harmony and render each other mutual assistance (mutualists), while others again feed only on the excess food ingested by the host (messmates). The boundary line between commensalism and parasitism is very hard to be drawn, and so far as it concerns our object it is perhaps not necessary for us to split straws over the question. The true parasite, however, is that creature which lives at the expense of another, devouring that which belongs to him and which should go to build up his tissues and repair his tissue waste. Some parasites (cestodes and trematodes) are free at the commencement of existence, and end it in some organ or cavity of the body. Some are imprisoned at the commencement and have a free existence at the close of life (gadflies). Parasites may be either of animal or vegetable nature.

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The vegetable parasites may consist of microscopic plants—bacteria, moulds, smuts, rusts, &c.—or of microscopic plants like the dodder, broom-rape, mistletoe, &c. The distinction between an animal and a vegetable form is narrowed to this, that animal forms must have ready formed protoplasm for their food, but vegetable forms can build up their tissues out of elementary chemical substances. Parasites play some great part in the economy of Nature, and, at one time, they were thought to arise spontaneously. The mystery surrounding their origin has been dispelled, and it is interesting to study their life-history, as it is only from an accurate knowledge of the life-histories of these pests that any control is capable of being exercised to arrest their development, thereby protecting ourselves and our flocks and herds from invasion. Animal parasites are found widely distributed in Nature. Mammals, birds, reptiles, and fishes and many organisms lower in the scales of existence are greatly infested. They may be found dwelling on the skin or inhabiting the tissues and cavities of the organs of their hosts. All animals harbor parasitical worms, and all these worms invade the organs and tissues from without. Speaking generally, they are introduced mainly by food and drink. It is part of the plan of nature that their means of reaching maturity shall be extremely difficult of accomplishment, for if it were ordained otherwise they would completely crush out of existence all other living things. Again, since the means afforded of attaining maturity are so difficult, it has been ordained that there shall be prolific births, for, in the struggle for their precarious existence, few forms indeed succeed in reaching adult age. There are definite laws governing the development of parasites. They are quite incapable of prolonging their existence unless they reach the organs and tissues of the animals upon which Nature has destined them to exist. Some, indeed, will not thrive, but absolutely perish, unless they reach particular creatures. Again, not only must they reach particular creatures, but they must also reach particular organs and tissues before existence can be supported. The complexity of their development is a continual round of danger to the maintenance of their existence. Unless this were so, they would become so numerous as to threaten the balance of the scales of existence of all highly-organized animals. A single female may give birth to ova that are capable of developing into millions of adult forms, but circumstances are always so adverse to their development that but few ever succeed in reaching maturity. Nature, taken into account the complexity of the development, has ordained prolific births, full well knowing that only a comparatively few individuals will, in the course of their adventurous careers, overcome the obstacles presented, and reach maturity to prolong their kind. If, indeed, these creatures threaten the flocks and herds of the pastoralist, we have at our command a knowledge of their development, and by the exercise of reasoning intelligence and the application of suitable remedies, we can repel with considerable force destructive invasion. All other forms of animal existence, as before remarked, live upon the

results of their own labours. They build up their tissues from booty of their own depredations. Parasites live upon the juices of the bodies of the animals they infest. They, in the main, disturb the health of their host, and tend to bring its existence to an end. For this reason, wherever present, they should be compelled to relinquish the dwelling into which they entered uninvited, and it is by an intelligent application of therapeutical agents and prophylactic measures that we are able to come to the assistance of animals, and rid them of enemies that depreciate their market value, or end their existence. The division of animal parasites infesting our flocks and herds, of which we shall first treat in subsequent numbers, is the cestodes, or ribbon or tapeworms. This season they have been particularly prolific, and our lamb trade has been markedly injured by their appearance in excess. How they maintain their adult existence, how they perpetuate their species, how they pass one generation in an immature form in a creature altogether distinct from the one in which their adult existence is supported, and how they reach these creatures to consummate their marvellous life-history, and what measures we should adopt to frustrate their career, are studies of the utmost economic importance to all engaged in the industry of raising flocks and herds. By well-directed efforts producers can lessen mortality, and can secure increased profits from additional attention to the wants and requirements of their stock.

FOWL TICK (ARGAS AMERICANUS).

A. A. Brown, M.B., B.S.

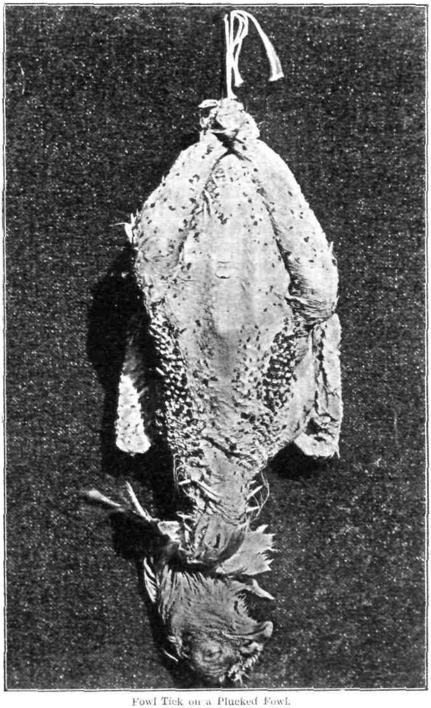
Introduction.

The ravages committed upon the herds of Queensland by the cattle tick (*Ixodes Bovis*) caused both scientists and pastoralists to turn their attention to devise means to stay the great mortality, and science was not backward in coming to the rescue. The bush tick (*Ixodes Plumbeus*) in Eastern Gippsland, proves fatal to calves, lambs, fowls, dogs, and other small creatures. Yet another pest, the fowl tick (*Argas Americanus*), which claims Texas as its seat of origin, and which is very destructive to poultry, is now creating alarm to poultry-breeders. The poultry yards of Mildura were the first in this State to be invaded by the pest. The fowl tick is allied to the mites and spiders, and is not very distinctly related to the Queensland cattle tick. As a matter of fact, ticks are mites of gigantic size, with bodies of a leathery consistence. The fowl tick evidently found its way to Mildura either from South Australia or from New South Wales. In South Australia it has been particularly destructive: and reports from New South Wales concerning its depredations are equally as unfavorable. Another variety of the Argasides (*Argas reflexus*) attacks pigeons, and yet another (the *Argas Persicus*) is said to be common in the fowl-houses of Persia, and to attack human beings. The *Argas moubata* in Angola, and the *Argas talaje* in Guatemala, are said to be very destructive to birds.

Anatomical Characters.

After the ingestion of blood the colour of the body is reddish brown. The length varies. Usually it is a quarter of an inch, but may even be three-eighths of an inch in length. The female is considerably larger than the male. The breadth averages about one-sixth of an inch. The body, which is very thin, is flattened superiorly and inferiorly, and is oval in shape. The dorsal portion of the body anteriorly projects over the head and mouth, so that these parts lie behind the margin of the body boundary, and posteriorly the body projects beyond the anal and reproductive openings. The whole appearance presents a tortoise shape. The whole margin of the dorsal surface is turned upwards, and is serrated. The upper surface is covered with numerous round pits, which vary in size. They are larger in the middle of the back, and become smaller as the edge of the body is approached. Two large pits occupy the middle of the anterior third of the body, and lie just in front of the middle transverse curved row of six pits smaller in size. Behind these again are six other prominent pits. On the posterior third of the body are radiatory rows of these pits. The margin of the ventral surface of the body is pitted as on dorsal surface. The palpi are long and slender, and even when stretched out do not reach anterior edge of

body. Of the mouth parts, the maxillæ are small and jointed, and the mandibles saw-like, being covered with teeth-like projections *sharply pointed.* The maxillæ and mandibles form a beak, which the tick pushes into the skin of its victim, and can only with difficulty



Fowl Tick on a Plucked Fowl.

be detached. A chitinous framework supports the legs and mandibles. The cuticle of the whole body is tough and resistant, and penetrated by the stigmata or breathing pores. The stigmata are the external openings of the tracheæ or air-tubes—the organs of

respiration—which ramify through the body. There are four pairs of hairy legs, each consisting of five segments, and the distal segments possess long curved claws.

Life History.

The female, which is larger than the male, lays a great number of eggs. The eggs are laid in clusters of from 30 to 100 or more. In some cases even the young are born hatched. The eggs are laid in crevices of wood-work, or under the bark of trees, or in any sheltered situation. They may even be laid on the body of the fowl—under its wings and legs and along its neck. The young are soon hatched. They are about one-twenty-fifth or one-thirtieth of an inch long, and are very unlike the adult form. They possess three distinct pairs of legs.

The palpi and mouth parts project in front of anterior end of body. These parasites frequently moult, and seem, even when deprived of food, to regain new vigour after moulting. They can be kept twelve months without food. During the first and second stages of development the ticks may be found attached to the bodies of fowls day and night, and they seem to do a great deal of injury to the birds.

Habits.

The adult forms are nocturnal in habit, *i.e.*, they move about at night, but the young, in many cases, appear to cling to the birds both by day and by night. The adults hide by day in the crevices of the fowl-houses, or under the bark of trees, or other secluded places, and may even perhaps hide under the wings of fowls, and they issue forth at night to commit their depredations. They prey on the blood of fowls, and cause anæmia and death. When they have sucked themselves full of blood they fall off the fowls and retire into the crevices, and come out again when hungry. When they bite their victims they may also inject a poison into their blood streams. The bush tick (*Ixodes plumbeus*) injects a poison into its victims. Its bite sets up considerable irritation around the spot. The fowl ticks creep in masses upon their victims and get under their wings and legs.

Symptoms Produced by the Tick.

The symptoms are indefinite. The fowls droop, refuse to eat and drink, and in a few days they are unable to move about, and die of exhaustion. As the ticks are not, except in rare cases, seen about by day the cause of the mortality may for a long time escape notice, but examination of the fowl-houses at night will eventually lead to the discovery of the cause. The presence of the young forms on the bodies of birds settles all doubt.

Natural Habitat.

These parasites are exotic. Their natural habitat points to Texas—the home of the cattle tick. They have reached Australia through importations of fresh stock from across the seas.

Remedial Measures.

Fowl ticks are very tenacious of life, and the only way they can be destroyed, when found upon the bodies of fowls, is by resorting to remedies that, whilst suffocating them, will not injure the birds. To kill these pests it is necessary to block up their stigmata or breathing pores, by which air is admitted to the air tubes. When their breathing is arrested they die practically of suffocation. I have found, by actual experiment, that kerosene alone is not an effective remedy, but that kerosene and soap emulsion is. Oil alone is not to be relied upon, but a mixture of oil (two parts), caustic potash, 10 per cent. solution (four parts), and kerosene (six parts) is a deadly compound to tick, and makes a most effective dip. Solutions of 1 in 250 of formalin (40 per cent. solution) make effective dips. Mixtures of kerosene and oil bring about death, so also do mixtures of oil and caustic potash. Strong solutions of ammonia in time kill them, but alcohol entirely fails to injure them. Strong solutions of either arsenious acid or perchloride of mercury are absolutely worthless remedies.

When fowl tick appears on a place there is no other course open, if the owner wishes to rid himself of the pest, but to pull down wooden fowl-houses and erect corrugated-iron ones, capable of being readily dismantled. The whole outside—roof and sides—should be coated with asbestos paint, as that tends in summer to produce a diminution in the temperature of the building. The whole inside should be tarred. The houses should be from time to time dismantled and washed with solutions of lime and sulphur, and then again tarred over. The roosts should be supported on a framework suspended by wire supports, attached to fittings on the roof, and no part of framework or its fittings should be brought up close to the sides of the building. The wire supports of framework should pass through sealed tin cup-like arrangements, and the cups should be kept continuously full of strong solutions of formalin, or of the oil and kerosene mixture.

All places that harbor tick should, where practicable, be burnt, but where this is impracticable all crevices should be cemented up and coated with tar. Ticks hide sometimes under the bark of trees, and such trees should be uprooted and burnt. No half-measures are of any use in attempting to exterminate this pest, but the most drastic measures must be adopted to secure successful eradication. All crates arriving from places where fowl tick abound should be destroyed, as by means of such crates the disease may get introduced into localities previously free from it.

Mr. Morrissey, the Minister of Agriculture, has in view of the spread of the disease, promptly had the pest scheduled amongst the list of contagious diseases as tick fever in fowls, and by this means power is vested in stock inspectors to deal suitably with any outbreak in their districts.

DIAGRAMS OF FOWL TICK (ARGAS AMERICANUS).

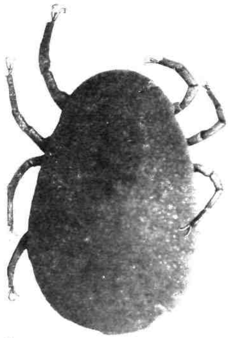
(Photographs kindly taken by Mr. A. Carmichael, Income Tax Commissioner's Office.)

FEMALE. FEMALE. MALE. MALE.

DORSAL ASPECT. VENTRAL ASPECT. VENTRAL ASPECT. DORSAL ASPECT.

Magnified 2¾ times.

FEMALE.



DORSAL ASPECT. *Magnified 9 times.*

FEMALE.

VENTRAL ASPECT. *Magnified 9 times.*

TECHNICAL EDUCATION AT THE AGRICULTURAL SOCIETY'S SHOWS.

By J. Knight.

For some years past attempts have been made at the leading rural Agricultural Society's shows throughout the State to supplement local effort with representative exhibits provided by the Department of Agriculture.

Owing, however, largely to the varied and inadequate accommodation usually provided in many instances, the educational value of the exhibits, and the facilities made available for demonstrating their merit, were stultified. This was recognised by Mr. Morrissey, the Minister of Agriculture, and through him we are now provided with a substantial, capacious, and attractive marquee, measuring 60 x 30 feet. This was made available for a number of leading shows held this season, and enabled this portion of the Department's work to be reorganized, and its scope enlarged so as to embrace several valuable phases of technical education, which must re-act beneficially on our rural industries.

The methods now adopted of classifying and arranging the exhibits of economic interest so as to appeal in the most practical and commonsense manner to our visitors, as well as the order in which lectures and demonstrations are given, have been instrumental in attracting large attendances. Each section of exhibits is so disposed as to illustrate in systematic form the various products, methods of growth, and preparation which can be applied locally, and to the best advantage. I am further intrusted with the valuable exhibit of products grown at the Dookie Agricultural College Farm, under the direction of Mr. Hugh Pye. The Department has given particular attention to the encouragement of growing fodders and cereals for the export trade. Not only are the best varieties in each section shown in their several stages of growth, but also the most servicable and economical methods of preparing them for immediate export. Great care has been taken to classify and exhibit varieties specially suited to the development of our export trade in fruits. Models of such are exposed, and the methods of selection, grading, and packing fully explained.

A number of special products are on view with the object of encouraging our producers to test their commercial value and opening up fresh fields for rural enterprise. The flax, ramee, canaigre, broom corn, and many other such useful products are thus prominently brought under the direct cognisance of those whose life-work, and its success are dependent on such developments. The diagrams and photographs, as well as numerous samples shown, clearly evidence the vast profits to be gained by the utilization of artificial manures. They are arranged and illustrated in excellent order by the chemist of the Department.

A subject of constant inquiry by those who visit these shows is how to deal with our insect and fungoid pests in field, orchard, and garden. Complete illustrations are provided which graphically disclose the life-history of these pests, their functions, and the remedial measures advocated for dealing effectively with them. These are provided and arranged by the Government Entomologist and Vegetable Pathologist. Another avenue for the dissemination of useful hints and guides to growers is the bulletins and publications issued by the Department. These are brought under the eye of the farmer, orchardist, and dairymen, and distributed to the men for whom they are intended. Recently a most valuable addition has been made to the list of subjects dwelt with by Mr. Hart, who, with his staff, give excellent lectures and demonstrations for the encouragement of our poultry and egg export trade. It includes lessons on the most suitable and profitable classes of poultry to breed, rear, feed, and prepare for export as well as domestic use. This unquestionably has done much towards stimulating an interest in this phase of rural life: so helpful as it must prove to every home in which the influence of the female portion of the household can be practically utilized. These lectures have been must popular, and highly encouraging results may be justly anticipated. Throughout the period occupied at each show the staff is busily engaged not only in short lectures and practical demonstrations, but also in answering innumerable inquiries relating to almost every detail of farm life and production. The farmer exhibits a keen interest in gaining hints as to the work of growing special products in which the dull routine may be relieved by devoting some time to testing their value and the diversity of the work attached to it.

This means of coming into direct contact with the farmer, discussing points of detail with him, encouraging criticism, and allaying doubts, must end in returns of unknown extent. More particularly is this noticed in the advocacy of economical methods by which the cost of production is lessened.

The incessant travelling, arranging, classifying, and packing entails considerable work on my staff, and it is only right that I should acknowledge the loyalty, zeal, and assuidity with which this arduous work is performed, and the cheerful and unselfish way in which I am assisted.

The success of these efforts during the past season in this work of educational propoganda is such as to warrant its extension at future shows, and to this end I do not hesitate to direct the attention of agricultural societies to its inestimable usefulness.

THE GOLD JUBILEE EXHIBITION, BENDIGO.

By J. Knight.

Since its inauguration, the Department has always taken a prominent part in illustrating the progress made in agriculture and its allied industries, as well as assumed educational functions at the leading exhibitions held in the State. Necessarily, the experience gained in the past, and the stern regard paid to keeping in the van of progress, has enabled the Department to excel all previous efforts in providing a special court at the Gold Jubilee Exhibition at Bendigo. By direction of the Minister of Agriculture care has been taken to make this court thoroughly representative of the great producing interests of the State, and to act as a guiding incentive to those whose inclinations lead them to settle on the land. Apart from this, special

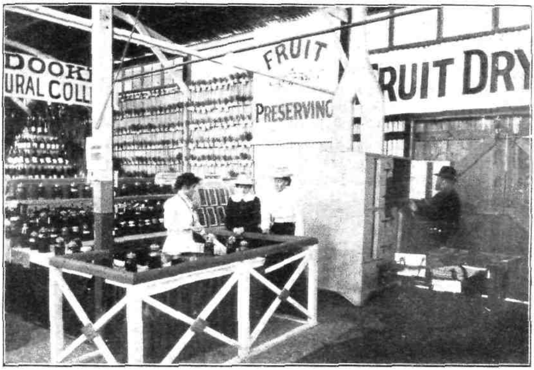
effort has been directed to render the court a centre of technical educational work, by which the various phases of development, agricultural in technique, are taught and demonstrated. The photographs illustrating this article will afford sufficient evidence of the means taken to make this portion of the Exhibition not only of really earnest instructive value, but also a tangible means of directing attention to the great possibilities open to those who contemplate occupying or taking up land in our thinly-populated State, and the admirable opportunities offered to those who will earnestly devote practical attention to more intense culture, and the numerous profitable avenues yet awaiting exploitation. To this end no pains or reasonable

expense has been spared to make this court one of permanent value, and in which those engaged in rural pursuits might spend days, and

even weeks, by investigating and thoroughly studying the specimens and exhibits brought together, and also by attending the various

courses of practical tuition and demonstrations, all of which are designed and organized to aid the producer, through which it is

hoped his enterprise and intelligence may be stimulated and guided towards remunerative returns. Here special care has been observed



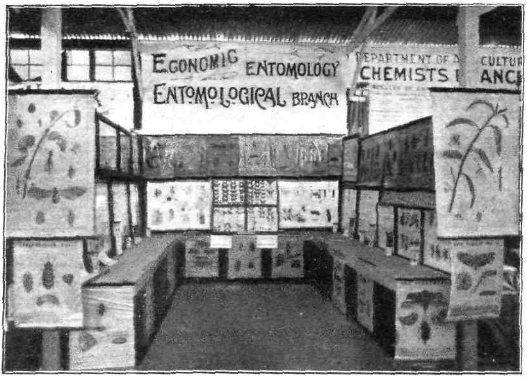
to keep the educational work secluded and free from the jarring or disturbing influences usually found present at exhibitions. On entering

the court from the main door, the section under my care is found on the right, and is subdivided into separate stalls or compartments.

Over each are to be found notifications fully descriptive of the purpose to which each stall is devoted.

These are equipped and arranged in systematic order by the heads of the various branches, under the control of the Department of Agriculture: not so much to illustrate the work accomplished as to provide guidance and information to those whose life-work is stimulated by such useful educational means.

The first section to catch the visitor's eye is that dealing with special products of economic value. In this the producer has ample means afforded him of studying the growth of plants eminently suitable to our climatic conditions, and for which there exists unlimited outside markets. To prove that such is the case, that they can be grown well, the plants dried and in various stages of development, are



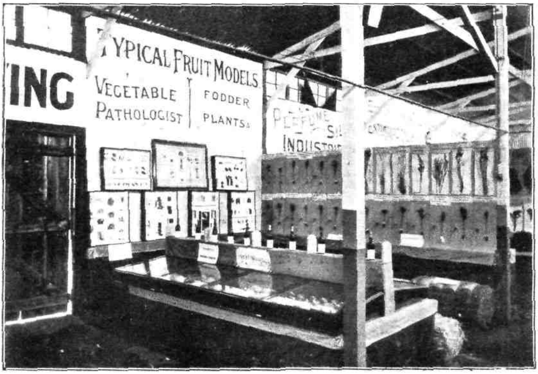
mounted and placed alongside examples introduced from countries in which the staple products are at present obtained.

In this, as well as in other sections, an officer is always present to afford information relating to growth, soil, cultivation, values, and so forth.

Considerable attention has been given to elucidate the various economic features of growing plants suitable for the manufacture of perfumes. The technical details of distillation are taught daily. Such industries as the production of lavender, peppermint, geranium, rose, &c., are yet in their infancy, but in them are possibilities yet to be disclosed. The exhibition of plants and the ramifications attendant on their practical application are readily recognised by the visitor, so plain and distinct has been the arrangement. Here we notice the flax fibre, linseed and its oil and cake, hemp, ramee, sumach, valonia

canaigre, the plants from which we derive tea, camphor, &c. The horticultural section contains models of all the leading varieties of fruits, and classified so as to aid the fruit-grower to identify the many varieties grown, and also those which have been specially grown for an export trade. The court devoted to fodder plants is eminently useful at the present juncture, when the growth of suitable fodder is so urgently needed to maintain our butter trade.

A glance at the chemist's branch is a lasting reminder of the duty every agriculturist owes to the study of the important phase of reviving exhausted or stimulating weak soils by means of artificial fertilizers. It is a revelation to peruse the carefully prepared statistics, plainly showing the results of experimental work. In this department



alone the agriculturist would do well to ponder over the relief afforded him by the wealth exposed to reach through the aid of scientific research work.

The practical side of agricultural development has a lasting champion in the splendid display shown by the principal of Dookie Agricultural College. This must appeal to every visitor engaged in agricultural pursuits. Dookie is situated in a dry district, unaided by irrigation, and solely dependent on a poor class of soil. The exhibit of wheat forms an educational medium, by which thousands of our producers may derive incalculable gain. Olives and olive oil are also exhibited in a form which distinctly proves we have nothing to learn from the older countries, where our chief supplies are raised.

Wherever intense culture prevails, or the growth of cereals and other products is conducted, it seems inevitable that man has to be assailed with insect and other pests. The grain field, root crops,

orchard, and vineyard alike are subjected to a bewildering series of scourges either of insect life or fungoid disease, and were we to rely on ordinary everyday skill to deal with these then a short existence would be meted out to many of our increasing industries. In the control of such diseases we have to rest on the skill of our entomologist, Mr. French, and his coadjutor, the vegetable pathologist, Mr. McAlpine. The former has provided the court dealing with insect pests with a classified collection of destructive moths, insects, &c., to assist in educating the producer in identifying them and determining the baneful influence of invasions, as well as advising as to the most complete means devised by science to eradicate or keep them under control. It is fully realized by all producers that no more useful work is carried on by the Department than this, and it is pleasing to record that it is as fully appreciated at the Exhibition. In close relationship may be mentioned the work conducted by Mr. McAlpine in his arduous work in identifying and determining the fungi and parasitic diseases which affect our fruit trees and other forms of growth. The numerous bulletins and handbooks published by the Department relating to the work of Messrs. French and McAlpine are indispensable to the library of every fruit-grower and agriculturist in the State.

Fruit Preserving, Evaporation, and Bottling.

During the whole period which the Exhibition will be open special attention will be given to demonstrations in collecting, grading, preparing, and cooking food for preservation. This is attended to by Miss Knight, whose lengthened experience and intimate knowledge of the subject renders her eminently suitable for this work. Two hours per day for three days in the week are spent at this particular section. In it we have object lessons that may be applied daily in our kitchens. All the details surrounding the successful preservation of fruit are placed in a simple and readily-understood fashion before the public.

Two days per week are devoted by Mr. Robilliard to that important phase of horticulture, viz., fruit-drying. In this matter alone rests an unlimited source of wealth to our fruit-growers. A personal acquaintance with the principles underlying each operation is essential to success, and here the opportunity is offered to every horticulturist to make himself conversant with a system by which he can convert hitherto useless quantities of fruit into a profitable source of income.

Regular courses of lectures, with practical demonstrations, are given in each section under my control, and in addition we distribute a number of bulletins relating to almost every phase of production practised in the State.

REGULATIONS FOR THE SHIPMENT OF FROZEN PRODUCTS.

BUTTER.

The inside measurement of butter boxes should be 12 inches by 12 inches by 12 inches. The weight should not exceed 11 lbs., and the timber should not be less than $\frac{3}{4}$in. thick, and well dried. Imperfectly seasoned timber should not be used, as it taints the butter.

Second-hand, unbranded, indistinctly branded, soiled, or badly-nailed boxes will be rejected.

In packing butter the best vegetable parchment paper should be used for lining the boxes.

Fifty-seven pounds of butter should be placed in each box, so that no package will contain less than 56 lbs. on reaching its destination.

Both ends of the cases should be legibly marked with the registered brand or trade mark, the name of the factory, 56 lbs. net, and Victoria or Victorian produce; stencil brands should not be used.

Butter should arrive at the Government Cool Stores six days prior to the date of steamer sailing, to enable it to be properly cooled or frozen.

Cases without marks will not be received, and no responsibility will be taken.

Advice of each consignment should be sent, addressed to the Government Dairy Expert, Government Cool Stores, Flinders-street, Melbourne, giving the number of boxes of each mark, and name of agents through whom it is consigned.

Where two or more agents are appointed to represent a factory, separate brands should be used to avoid confusion.

Consignments intended for export to places other than London, must be port marked prior to delivery at the Cool Stores, and cases for South African ports are recommended to be wired at each end.

CHEESE.

The Regulations in reference to the despatch of butter for export apply to cheese. Oregon timber should be used for crates, and the following measurements should be adhered to:—Length, $25\frac{1}{2}$ inches; diameter, $15\frac{1}{4}$ inches; weight, about 14 lbs.; ends, $\frac{3}{8}$ inch thick; centre boards, $\frac{1}{8}$ inch, and sides $\frac{3}{8}$ inch. Three cheeses of 40 lbs. or two cheeses of 60 lbs. are packed in each case.

Registered mark or brand, with net weight and Victorian Produce, to be placed on both ends of the package. Each end should be bound with hoop iron.

RABBITS AND HARES.

Rabbits must be trapped or snared, killed, bled, and gutted before being sent to the Cool Stores. They should be forwarded in pairs

hung across a stick; overcrowding should be avoided. Boxes must be in a clean and good condition. Rabbits in a poor, mouldy, or sweaty state, or otherwise unsuitable for export, will be rejected.

Those unfit for human consumption will be condemned. They are classified for export in the following grades, viz :—

Large fur rabbits $2\frac{1}{2}$ lbs. and over in weight, 12 pairs per crate.
Young fur rabbits 2 lbs. and under $2\frac{1}{2}$ lbs., 12 pairs per crate.
Small fur rabbits $1\frac{3}{4}$ lbs. and under 2 lbs., 14 pairs per crate.
Skinned rabbits, 15 pairs per crate.

Poultry and Game.

Consignments must be forwarded in first-class condition, railway freight prepaid, and owners must arrange to take delivery of their bills of lading which can be done on payment of ocean freight and charges. In cases where the shippers cannot attend personally to such matters, it will be necessary for them to appoint a representative in Melbourne to carry out this portion of the business and take charge of rejects.

Fowls (roosters and pullets) are packed in crates holding fifteen and twenty head, in the case of boiling fowls and ducks. Roosters, pullets, and boiling fowls should not weigh less than $3\frac{1}{2}$ lbs. (live weight) for the English market, and should not be under six months old.

With ducks the weight should not be less than 4 lbs. (live weight); ducklings from nine to eleven weeks command the best prices. Dark feathered ducks should not be sent, as they are unsuitable for the English market. A cross between Pekin and Aylesbury is highly recommended for the export trade.

The weight of goslings should not be less than 10 lbs. (live weight).

Four pairs are packed in a crate.

Turkeys must not exceed twelve months in age, and should not weigh less than (gobblers) 12 lbs. and (hens) 8 lbs. (live weight). It is found that grass-fed turkeys are not suited to the English taste, being tough and dark coloured. Hand-feeding for some time previous to shipment is recommended.

The best months for shipment to the English markets are as follow :—Fowls, ducks, and geese, from 1st January to 1st April; and turkeys, from 1st October to 1st April. During last year good prices were obtained in South Africa and West Australia all the year round.

Goslings will be found profitable if shipped from December to March.

Game can be shipped to advantage in season to South Africa. The most profitable kinds are black duck and teal.

Eggs.

In forwarding to the Government Cool Stores, care must be taken that plenty of packing is used, with a sheet of paper between each layer of eggs. They are shipped in cases containing 12 dozen eggs each.

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A surplus of 2 dozen eggs should accompany each consignment, to be used in replacing breakages. Any eggs not so used will be returned to shipper or his agent.

The eggs should be fresh and clean when consigned, graded according to size and colour, and packed in clean, dry material free from dust and smell.

Mutton and Lamb.

Sheep and lambs will require to be killed and dressed in a proper manner, and be free from animal heat prior to being forwarded to the Government Cool Stores for freezing and shipment. Nice chubby cross-bred lambs about six months old are best for export.

Louvre trucks are recommended for transit from the abattoirs to the Government Cool Stores, and due notice to the railway authorities will require to be given for the same.

Application for required space in the freezing chambers, stating quantity, weight, and other particulars, must be made to the Dairy Expert, Government Cool Stores, Flinders-street.

Beef and Veal.

Only beef and veal of good quality and condition, and free from disease, are permitted to be shipped. Calves should scale between 100 and 150 lbs., and when shipped in their skins, it is advisable to wash and clean them, in order that they will have a presentable appearance.

Pork.

Pigs must be of first-class quality, grain-topped, and should weigh from 65 to 75 lbs. per carcass killed and dressed.

The best period for shipment to the English market is from October to March inclusive.

On and after the 1st January, 1902, the charges for handling, freezing, shipping, storing, &c., of Produce delivered to the Government Freezing Works shall be as follows:—

Produce.	Handling, Freezing, Shipping, &c.		Storage.	Per week or portion of week.
Butter	Per box	3d.	Per box	1½d.
	Per cask	5d.	Per cask ...	2d.
Milk	Per case (small)	3d.	Per case ...	1½d.
	" (large)	5d.	" ...	2d.
Cheese ...	Per crate	5d.	Per crate ...	2d.
Eggs ...	Per dozen	1½d.	Per 20 dozen ...	1½d.
Poultry—				
Chickens ...	Per pair	7d.	Per crate ...	1½d.
Ducks ...	"	7d.	" ...	1½d.
Geese ...	"	1s.	" ...	1½d.
Turkeys ...	"	1s.	" ...	1½d.
Game	" (12 pairs to 24 pairs to case)	2d.	" ...	1½d.
	" (25 pairs to 50 pairs to case)	1d.	" ...	1½d.
	" (over 50 pairs to case) ...	½d.	" ...	1½d.

CHARGES FOR HANDLING, FREEZING, SHIPPING, STORING, ETC.—*continued.*

Produce.	Handling, Freezing, Shipping, &c.		Storage.	
				Per week or portion of week.
Pork	Per carcass	9d.	Per carcass ...	1½d.
	Per side	6d.	*Per side* ...	1½d.
Veal ...	Per 50 lbs.	9d.	Per 50 lbs. ...	1½d.
Beef ...	"	9d.	" ...	1½d.
Mutton ...	Per carcass	9d.	Per carcass ...	1½d.
Lamb ...	"	9d.	" ...	1½d.
Rabbits (furred)	Per pair	2d.	Per crate ...	1½d.
Rabbits (skinned)	"	1½d.	" ...	1½d.
Hares ...	"	4d.	" ...	1½d.
Fruit ...	Per case	2d.	Per case ...	1½d.
Sundries ...	Per 50 lbs.	9d.	Per 50 lbs. ...	1½d.

NOTE.—The charges for handling, freezing, shipping, &c., cover 14 days' storage in the case of butter, milk, cheese, eggs, and fruit, and 21 days' storage on all other produce from date of receipt, after which period storage will be charged at per week or portion of a week.

In the case of produce being stored for local purposes, the first charge will cover a period of seven days' storage only.

Crates of poultry, game, rabbits, or hares delivered to Freezing Works ready packed will be charged storage at the rate of 6d. per crate for the first week, and 1½d. per crate per week after. If, however, received already frozen, the charge for first week shall be 3d. An extra charge of 1d. per package or carcass will be made for any alteration required in the brand or marks.

Extra wraps for mutton, lambs, or beef shall be charged additional, equivalent to cost of wraps and labour. Weighing of mutton, lamb, beef, pork, or veal outwards will be charged for at rate of ½d. per carcass or per 50 lbs.

Butter, &c., arriving at the Cool Stores and taken delivery of the same day, before being put in freezing-rooms will be charged 1d. per case.

All charges must be paid by the shipper or his agent, together with freight, &c., before obtaining delivery of bills of lading.

E. G. DUFFUS,

Secretary for Agriculture.

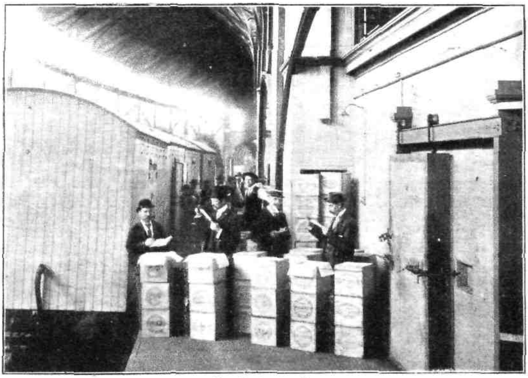
EXPORTS BRANCH.

EXPORT BUTTER.

By R. Crowe.

It is generally understood that all butter exported has to be first inspected in accordance with the *Exported Products Act* 1898, but the nature, extent, and uses of the inspection do not seem to be so well known.

The Act stipulates that unless otherwise permitted by an inspector all butter is to be detained in a cool store before shipment, until properly cooled or frozen. Until recently, butter below 42° was considered sufficiently cooled, but now, on account of experience having proved that butter keeps better at a lower temperature, 25° F. is



Grading Butter for Export.

agreed upon as the temperature for shipping. All butter for export is graded, and, when found good, it is stamped "Approved for export" over a Crown, with the word "Victoria" underneath, whilst butter of a quality not fit for ordinary table use, but suitable for cooking purposes is branded with the word "Pastry."

Any butter presented for export unfit to be included in either of the grades mentioned is not permitted to be exported. The stamp indicates that it has been inspected, the use of brands is checked, and it is guaranteed that only pure wholesome butter is exported.

If the supervision of the butter export trade went no further the efforts of the State in this direction would be justified. However, other valuable purposes are served by recording the quality of each consignment minutely, noting faults, and giving instructions as to where improvement is needed. In this way the quality is systematically looked after. Out of every consignment three boxes are taken at random, stripped, and weighed. The weights are recorded and, if the packing, the paper, the boxes, branding, or finish on the butter be found faulty, full particulars are noted.

The butter is then examined for aroma and flavour, texture, extent of moisture, as well as colour.

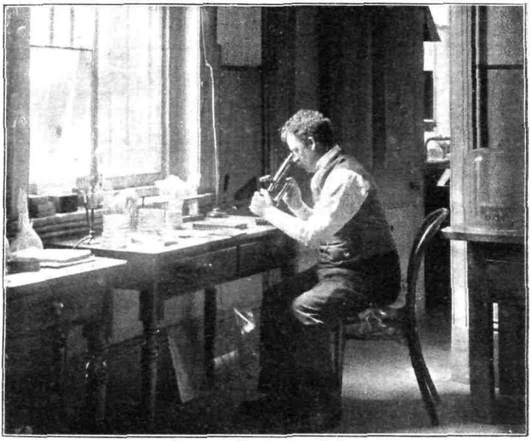
Chemical Analysis of Butter.

Points are allotted for flavour, texture, and condition, 50, 30 and 20 being the maxima respectively. Then, at the earliest opportunity, the makers of butter capable of distinct improvement are communicated with. The nature and extent of the faults are given, and advice tendered as to the best manner of overcoming same.

At the end of each week during the export season, Mr. Potts and the dairy supervisors recently appointed are given a list of factories requiring attention. Those officers then note the records and reports relating to those factories, and visit them to instruct the factory manager, the employés, or suppliers, as the case may be, so that the

quality will be improved. The records in reference to quality kept at the freezing works serve to measure the amount of good done in each case. In addition to the examination referred to, samples are taken for chemical analysis and bacterial examinations.

It is recognised that the milk from every herd is capable of being made into the best quality of butter if properly treated and manipulated; therefore, if the resultant product is not up to the mark, the cause is to be found at some stage between the Government Cool Stores and the cows.



Microscopic Examination of Butter.

Extracts from Reports to Butter Factory Managers will perhaps more clearly illustrate the nature and direction of this educational work :—

Re WEIGHT OF BUTTER.

"Three boxes of your consignment of 4th inst. weighed 55¾, 56½, and 57¼ lbs. This is due to either the use of unsuitable scales, or gross carelessness on the part of the butter packer. If the scales are at fault they should be put in order at once, or replaced with a new set suitable for the purpose. Or, if the man is to blame, remedial measures should be applied in the interests of your company. You will note that this is the second occasion that your attention has been directed to the matter recently. The quality is still all that could be desired. The score for the last lot was 48, 30, 20, or a total of 98 points."

Re Packing and Finish.

"On stripping your butter, received to-day, it was found to be very badly packed. The corners are not well filled, and in the side of one box there was a space unfilled almost as large as one's hand. You should empty the contents of a few boxes after the butter has set, and then you will see for yourself that more attention is required in the packing of your butter. The finish might also be improved: it is very plain and unattractive. You should at once secure a honeycomb roller to run over the top of the butter, or, better still, a copy of your trade mark carved on a wooden roller. The use of either will be a great improvement."

Re Moisture and Boric Acid.

"A composite sample of butter taken from three boxes of your consignment of 23rd ult. was found on analysis to contain 13·73 per cent. of moisture and 0·54 per cent. boric acid. The percentage of moisture is rather high for export butter. By attention to temperature and method of working the butter, you can easily get it down to below 12 per cent. You should endeavour to keep the moisture between 10 and 12 per cent. The boric acid is also high, and in the face of the recommendations recently made by the Departmental Committee in London to limit the use of boric acid in butter to 0·5 per cent., you should in future keep below that limit, as the recommendations may be adopted any day now."

Similar extracts might be quoted relating to condition of boxes or brands, colour, texture, flavour and aroma of butter. The system of personally visiting factories has so far proved most successful, and it is very gratifying that the Honorable the Minister of Agriculture has agreed to an extension of this kind of work, and before next season everything will be arranged to carry a system of examination of butter for export on a wider basis.

CLASSIFYING BUTTER.

By R. Crowe.

At the end of the export season a table is issued to exporters showing the result of the butter classification in percentages; by this means every factory manager finds out the position his butter holds as compared with that from other sources. Names of brands, factories, or quantities are not given, and each shipper recognises his result by the number given him. For instance, supposing he finds under his number, that 79·30 per cent. scored 98 points out of a possible of 100, that 11·01 per cent. scored 97, that 8·98 per cent. scored 96, and 0·70 per cent. scored 95 points: then, knowing that he exported—say, 14,245 boxes, it is only the work of a few moments to discover that 11,296 boxes received 98 points, 1,569 boxes got 97 points, 1,280 boxes secured 96 points, 100 boxes gained 95 points, and the average score was 97·68 points out of a possible of 100.

Quality Comparison for December.

The accompanying table of figures indicates the quality of butter from country factories for export for December, 1901 and 1900.

CLASSIFICATION OF BUTTER EXPORTED BY COUNTRY FACTORIES FOR DECEMBER, 1901, AND DECEMBER, 1900.

No.	Dec., 1901.	Dec., 1900.	No.	Dec., 1901.	Dec., 1900.	No.	Dec., 1901.	Dec., 1900.	No.	Dec., 1901.	Dec., 1900.
1	98·26	97·95	30	95·63	96·42	70	95·57	95·06	105	92·17	92·29
2	97·61	97·83	31	96·43	96·37	71	95·25	95·26	106	95·50	92·59
3	97·87	97·43	32	96·91	96·25	72	94·89	94·30	107	93·65	92·91
4	97·95	97·64	33	95·89	96·03	73	95·95	94·54	108	95·00	90·73
5	98·00	97·92	34	95·92	95·38	74	95·95	93·95	110	94·50	92·87
6	97·95	97·62	35	97·00	96·17	75	96·62	94·70	112	93·54	94·06
7	98·00	97·68	36	96·15	95·87	76	94·70	95·06	113	93·72	93·00
8	97·82	97·63	38	97·11	96·37	77	95·44	94·47	114	93·69	92·25
9	96·81	97·33	40	96·66	95·71	78	94·46	94·00	115	92·71	93·87
10	98·00	97·35	41	95·75	95·71	79	94·52	...	118	89·19	89·04
11	97·43	97·73	42	97·01	95·61	81	94·29	94·56	119	92·23	91·20
12	97·18	96·48	44	97·33	95·95	82	95·43	95·77	120	92·00	90·19
13	97·48	97·53	45	97·27	96·63	83	94·00	93·86	122	90·47	90·63
14	98·00	97·63	46	96·34	95·24	85	94·50	94·19	123	93·36	92·23
15	97·21	96·75	47	96·25	95·84	87	96·00	94·56	124	88·31	90·99
16	96·96	96·99	48	92·67	95·74	88	94·11	93·74	127	91·76	91·12
17	97·68	96·20	49	96·00	93·34	89	94·50	94·71	128	91·20	...
18	97·20	96·12	51	96·10	95·06	91	95·73	94·04	129	92·44	92·64
19	97·00	96·06	52	96·69	96·15	92	95·27	94·46	130	92·50	93·00
20	96·79	96·62	55	94·65	94·68	93	94·48	95·34	131	93·00	93·26
21	96·72	97·10	56	97·09	94·05	95	94·58	95·58	132	91·60	90·54
22	95·63	96·14	57	95·54	95·22	96	94·00	94·47	34	92·95	90·95
23	97·71	97·00	58	96·00	95·11	97	95·82	94·41	135	93·00	90·00
24	96·63	96·08	59	96·96	95·25	98	93·61	94·06	138	93·46	...
25	97·07	96·56	63	95·45	96·00	99	96·00	94·57	139	95·73	...
26	97·27	96·61	64	97·00	95·04	100	95·05	92·40	140	94·81	94·93
27	97·10	95·87	66	94·87	95·11	102	94·27	93·80	141	93·00	...
28	96·78	95·97	69	95·38	94·54	104	94·32	93·17	142	95·53	...
29	96.78	95·92									

Factory managers may recognise the position their output for the past month holds as compared with the corresponding period of last season, as well as its relative place as regards other brands. The No. corresponds with that already advised.

In a few instances it may be seen that ground is lost in respect to quality, the cause of which has been pointed out by the departmental officers, but in most cases it is impossible to apply the suggested remedies until the end of the season; but the general result shows a decided improvement. I wish the whole of the gain, which amounts to an equivalent of over £1,000 for the month's output, could be credited as the result of the system adopted to educate factory managers and milk suppliers. Some portion is doubtless due to the quantities for the later period being more within the capacity of the factory plants and hands than for the same month the year before. This sum indicates only a portion of the gain, seeing it is determined solely on the butter intended for export, and does not include the portion made for local consumption. Moreover, we have the larger and undeterminable gain of a permanent character through the form of educational effort.

STATEMENT showing Quantities and Average Prices for best quality of Butter exported to Great Britain from Victoria for corresponding periods in the busiest part of the last three seasons.

Shipped for Week ended—	1899-1900.			1900-1.			1901-2.		
	Quantity.	Price.		Quantity.	Price.		Quantity.	Price.	
	cwt.	s.	d.	cwt.	s.	d.	cwt.	s.	d.
September 17 ...	3,642	105	5	5,180½	112	9	1,561	120	0
" 24 ...	9,708	101	8	5,696½	109	0	1,774½	115	2
October 1 ...	8,877	102	7	6,481½	107	1	3,103½	113	10
" 8 ...	11,049	104	4	9,278½	108	0	3,175½	113	10
" 15 ...	11,272½	105	1	4,777	111	9	3,107	113	3
" 22 ...	11,902½	104	9	11,790½	111	9	10,092	110	6
" 29 ...	13,658	104	8	11,658	111	6	8,694	106	8
November 5 ...	13,795½	101	7	12,064	110	2	9,807	106	4
" 12 ...	12,400	101	0	16,780½	111	4	5,037	...	
" 19 ...	9,415	100	0	16,047	108	6	12,370	...	
" 26 ...	11,313	98	2	12,044	113	0	11,992½	...	
December 3 ...	8,224½	97	2	10,853½	112	0	9,461	...	
" 10 ...	15,956½	96	10	12,103	108	4	8,880	...	
" 17 ...	18,600	100	4	11,115	108	2	8,020	...	
" 24 ...	10,547½	100	8	9,210½	108	7	6,480	...	
" 31 ...	13,795	98	0	7,013½	110	0	4,980	...	
January 7 ...	4,874	100	0	2,406½	107	6	...	...	
" 14 ...	11,282	97	0	4,896½	104	0	...	...	
" 21 ...	5,834	96	0	16,106	104	0	...	...	
" 28 ...	4,853	93	4	5,767½	106	0	...	...	
February 4 ...	3,790	93	4	4,366½	104	0	...	...	
" 11 ...	4,263½	92	6	2,907	104	0	...	..	

R. CROWE, Dairy Expert.

31st December, 1901.

PARTICULARS OF FROZEN PRODUCE EXPORTED FROM VICTORIA FOR DECEMBER, 1901.

—		Shipped through Government Cool Stores.	Shipped through Other Cool Stores.	Total Quantity Shipped.
Butter (Victorian)	lbs.	4,567,360	328,160	5,073,020
,, (,,) (tinned) ...	,,	...	177,500	
,, (Interstate)	,,	87,360	...	87,360
Milk and Cream (concentrated)	cases	1,064	...	1,064
Cheese	lbs.	...	24,960	24,960
Poultry (Fowls and Ducks) ...	head	9,720	...	9,720
,, (Geese and Turkeys)	,,	786	...	786
Eggs	doz.	1,291	...	1,291
Pork	carcasses	10	...	10
Veal	sides	48	...	48
,, ...	carcasses	49	...	49
Rabbits	pairs	49,130	...	49,130
Lamb and Mutton	carcasses	73,390	95,457	168,847
Beef	quarters	92	...	92
Sundries	boxes	97	...	97

R. CROWE, Dairy Expert.

31.12.01.

DAIRYING BRANCH.

SPECIAL LECTURES DURING JANUARY,

BY H. W. POTTS.

At the Summer School for Teachers, Training College, Carlton.

MONDAY, 13TH JANUARY.
11.30 a.m. to 12.30 p.m.
"The Composition of Milk and its Physical Characteristics."

TUESDAY, 14TH JANUARY.
11.30 a.m. to 12.30 p.m.
"The Story of Germ Life in relation to Dairying."

WEDNESDAY, 15TH JANUARY.
11.30 a.m. to 12.30 p.m.
"The Cow: Her Feed and Care. How to Milk and Dairy Management."

THURSDAY, 16TH JANUARY.
11.30 a.m. to 12.30 p.m.
"Testing Milk and Payment by Results."

Arrangements will be made to give microscopic and oxy-hydrogen lantern illustrations during special evenings to demonstrate the above.

These Lectures are intended for teachers living in dairying districts.

WEDNESDAY, 22ND JANUARY.

A Lecture will be given at Apollo Bay on "Modern Dairying," with lime-light illustrations, and the district visited with a view of ascertaining the possibilities of establishing a butter factory.